



STS CONSULTANTS



**STS CONSULTANTS, LTD.**

**Completion Report  
Lakeshore East  
221 North Columbus Drive  
Chicago, Illinois**

**Volume I of III**

**STS Project No. 1-32193-XC  
September 19, 2003**

**Lakeshore East LLC  
One West Superior, Suite 200  
Chicago, Illinois 60610**



**THE INFRASTRUCTURE IMPERATIVE**



**STS CONSULTANTS**

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September 16, 2003

Mr. Fred Micke, On-Scene Coordinator  
US Environmental Protection Agency - Region 5  
77 W. Jackson Blvd., SE-5J  
Chicago, Illinois 60604-3590

RE: Completion Report for Lakeshore East Project, 221 N. Columbus Drive, Chicago, Illinois - STS  
Project No. 1-32193-XC

Dear Mr. Micke:

Enclosed please find three sets of the completion report (three volumes per copy) for the thorium removal project at the Lakeshore East site. Upon receipt of the U.S. Environmental Protection Agency comments we will prepare a final revised report with a signed affidavit.

Please contact us with any questions you may have regarding this report or any other aspects of this project.

Sincerely,

STS CONSULTANTS, LTD.

Steven C. Kornder, Ph.D.  
Project Manager



THE INFRASTRUCTURE IMPERATIVE



## AFFIDAVIT

Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete.

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Steven C. Kornder, Ph.D.  
Project Manager

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Date



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**COMPLETION REPORT  
LAKESHORE EAST  
221 NORTH COLUMBUS DRIVE  
CHICAGO, ILLINOIS**

**1.0 INTRODUCTION**

**1.1 Work Completed in Accordance with USEPA Action Memorandum (July 17, 2002)**

The work described in this Completion Report conducted in accordance with an Action Memorandum from U.S. Environmental Protection Agency (USEPA), dated July 17, 2002, entitled "Action Memorandum—Determination of Threat to Public Health or the Environment and Need for Time Critical Removal Action at the Family Golf Course/Lake Shore East Site Chicago, Cook County, Chicago, Illinois (Site Spill ID #05YH)". A copy of the Action Memorandum is included as Appendix A.

**1.2 Work in Accordance with Approved Work Plan (September 30, 2002)**

The work completed for this Completion Report was conducted in accordance with the Work Plan for Investigation and Removal of Radiologically Impacted Soil (Work Plan) prepared by STS Consultants, Ltd. (STS) dated June 24, 2002, revised September 13, 2002 and September 30, 2002, and approved by the USEPA in correspondence dated September 30, 2002. A copy of the Work Plan is included as Appendix B. A copy of the USEPA approval letter is included as Appendix C.

The objective of the work described herein was to remove radiologically impacted soil to the cleanup levels specified by USEPA. With this demonstration that these cleanup levels have been achieved, it is requested that USEPA issue a Certification of Completion Letter, indicating that the site has been remediated of all identified radiologically impacted material.

**1.3 Location and Description of Property, Proposed Development**

The subject site consists of 25.18 acres located at the southwest corner of Wacker Drive and Lake Shore Drive, at 221 North Columbus Drive in Chicago, Illinois (Figure 1). The site is at approximately 41° 53' 40" North Latitude, 87° 37' 05" West Longitude, southwest ¼ of Section 10, Township 39N, Range 14E on the Chicago Loop, Illinois 7.5 Minute USGS Topographic Quadrangle Map.



The site is nearly flat topography at an elevation of approximately 590 feet above mean sea level (AMSL). This elevation is equivalent to approximately +10 feet Chicago City Datum (CCD). The site is bounded on the north by East Wacker Drive, currently occupied in part by a City of Chicago auto impound yard at ground level and Wacker Drive on an elevated viaduct. To the east is Lake Shore Drive. The south margin of the site is occupied by several residential high-rise buildings, East Randolph Street and commercial high-rise buildings. The west margin of the site is occupied by North Columbus Drive and commercial buildings. A small lake, a feature of the golf course that was formerly on the site, is located near the northwest corner of the site. The remainder of the site is vacant following removal of the golf operations. A Commonwealth Edison facility building is located on the adjacent property near the middle of the western side of the site, surrounded by a paved parking lot. Parcels O and P are located at the west end of the subject parcel and front on Columbus Drive to the west. Two buildings remain on Parcel P from the former golf operations, including a restaurant, clubhouse and office building and a maintenance shop, near the western end of the site. These two parcels, including the Commonwealth Edison property, are owned by other development parties and are not a part of this site for the purposes of this Completion Report. Figure 2 presents the site plan.

Proposed development will consist of residential townhouses and high-rise structures, with potential for some commercial development to be included.. An approximately six acre city park with an elementary school is planned for the interior portion of the site. City streets are planned for the site surrounding the park and school and providing access to the existing roadways surrounding the site. Figure 3 presents the currently proposed site development plan.

#### **1.4 Site History**

The site and near vicinity was created as artificial or "made land" by infilling along the Lake Michigan shoreline, with much of the infill process taking place in the later half of the 19<sup>th</sup> century. Sanborn Fire Insurance Maps (Sanborn Maps) indicate the site was developed with rail lines, grain elevators, warehousing structures, coal and lumber yards and Shipping Slips C, D and E by 1891. Slip C was oriented north-south opening onto the Chicago River and Slips D and E were oriented east-west and opened to Lake Michigan. Figure 4 shows the locations of Slips C, D and E as they were depicted in 1906 on the subject site. The 1906 Sanborn Maps show similar structures and uses of the subject property consistent with those shown on the 1891 maps, except that much of the southern extent of Slip C had been filled by 1906.

Inspection of 1929 Chicago Aerial Survey oblique aerial photographs show the site was primarily a rail freight yard with warehouse storage facilities on the property. Slips C, D and E had been filled by the

date of that aerial. Sanborn Maps from 1950, 1958 and 1962 indicate the site usage remained relatively unchanged with primary usage as rail freight yards, cold storage and general warehousing. Many of the warehouses from the 1906 Sanborn Maps had been razed. A 1980 aerial photograph indicates the commercial development of neighboring site properties, and only a few of the on-site rail lines remaining intact. The majority of the site is vacant in this photo, as most of the warehouses and other structures have been razed. A 1990 aerial photograph shows all the former site structures have been removed and North Lake Shore Drive has been reconfigured to its present-day location. The site is otherwise undeveloped. The site was developed as a golf course and practice range in 1994, and remained as such until the golf facility was closed for the implementation of the remediation conducted under the USEPA-approved Work Plan as documented herein.

### **1.5 Previous Phase I Investigations**

Phase I Environmental Site Assessments were conducted on the subject property. These were provided to STS and were reviewed as part of the investigation of this property. These reports are:

Dames & Moore, 1999, Updated Environmental Assessment (Phase I), 25-Acre Parcel SW Corner of Wacker and Lake Shore Drives, Chicago, Illinois: Rolling Meadows, Illinois, Job No. 44169-001-007, 15 p.

DAI Environmental, Inc., 2001, Phase I Environmental Site Assessment, Lakeshore East, 221 North Columbus Drive, Chicago, Illinois: Lake Forest, Illinois, Project No. 7230, 34 p.

### **1.6 Previous Radiological Surveys**

This Completion Report addresses the removal of soil and fill materials that were found to be impacted with thorium and various radioactive decay progeny. The presence of elevated radioactivity was initially reported by USEPA in correspondence dated July 2, 2001, included as Appendix D. Subsequent investigations by STS are presented in the following reports:

- Radiation Survey, 26-Acre Site, Southwest Corner Wacker Drive and Lake Shore Drive, 221 N. Columbus Drive, dated September 19, 2001
- Addendum to Report for Results of Expanded Gamma Radiation Survey at 26-Acre Site, 221 North Columbus Drive, dated October 2, 2001
- Test pit Exploration at 26-Acre Golf Course Site, Southwest Corner of Wacker Drive and Lake Shore Drive, Dated January 8, 2002

- Final Report for the Lakeshore East Additional Radiation Survey Investigation, Dated February 8, 2002

These reports, referenced as Appendix E, comprise Phase I of the radiological work at this site, and document the presence of radiological impacts (elevated levels of total radium measured as radium 226 + radium 228) at several locations on site. (Note the distinction between the Phase I Environmental Site Assessment investigations referred to in Section 1.5, and Phase I of the radiological investigation, referenced herein.) Figure 5 shows the locations of the radiological impacts identified in these previous radiological Phase I investigations. It is noteworthy that the impacts occur only at locations within or immediately adjacent to the former locations of two of the shipping slips, Slips D and E.

### **1.7 Organization of Completion Report**

Part 1.0 of this Completion Report presents the introduction and history of this site. Part 2.0 describes the activities that comprised the removal action. Part 3.0 documents the quantities of materials removed. Part 4.0 describes the difficulties encountered and the means by which those difficulties were resolved. Part 5.0 of this report presents the analytical results, including soil and air sampling, and both on-site and off-site laboratory analyses. Part 6.0 presents the conclusions of the report and requests a Completion Confirmation Letter from USEPA.

### **1.8 Resources (Costs) for Completion of Work**

As of July 25, 2003, the Lakeshore East project has incurred nearly \$3,042,000 in the completion of the Removal Action at the Subject Site. Additional costs may be incurred. Note that these costs do not include costs for disposal of radiologically-impacted soils provided through Kerr-McGee Chemical LLC and EnviroCare of Utah or USEPA oversight costs.



## **2.0 REMOVAL ACTION**

The removal action consisted of two general phases which followed the initial site exploration and survey phase, Phase I, referenced above in Section 1.6. Phase II was the removal of the radiologically impacted material previously identified, as shown on Figure 5, and described below under Section 2.3. Phase III consisted of the radiological monitoring and, as needed, removal of impacted material detected during the general site grading. This work is described under Section 2.4.

### **2.1 Site Work Documented Through Weekly and Monthly Progress Reports**

The work completed in the course of this removal effort was documented through weekly and monthly progress reports submitted to USEPA. These reports presented the work completed during the past week or month, and described the work planned to be completed in the coming week or month. The weekly reports also included the analytical results for the air sampling completed the previous week, both for the personal air monitors (PAMs) and for the perimeter air monitors. The analyses for the routine soil samples were not included in the weekly or monthly reports. The soil analyses for the verification analyses were submitted periodically with the request for USEPA sign off on successful remediation, and as a result were not also included with the weekly or monthly progress reports. The weekly and monthly reports are already on file with USEPA and are therefore not included as an attachment in this Completion Report.

### **2.2 Subdivision of Site (Slips D and E, Lift Survey Grids)**

To document the work at the site, grid systems were established for the specific areas where the radiological impacts were initially detected within Slips D and E. Additionally, a grid system was established to cover the entire site to facilitate documentation of the lift surveys conducted during the general site grading operations. Figure 6 presents the grid systems for Slips D and E. Note that since no impacted material was identified as being associated within Slip C, an initial grid system for the Phase II remediation work was not established for Slip C.

The site-wide grid system is shown on Figure 7. This grid system, at 200 feet X 200 feet, was used to document the monitoring conducted during the general site grading phase, Phase III, described below in Section 2.4. The site-wide grid system was laid out consistently with the site-wide construction coordinate system. The site-wide grid, consisting of partial to complete grids 1 through 40, was further sub-divided into 100 foot X 100 foot quarters, designated A through D, from the northwest quarter clockwise around to the southwest corner. Thus, the southeast quarter of grid 17 is designated 17C

### **2.3 Phase II Thorium Removal**

The Phase II work consisted of removing the previously identified radiologically-impacted material to clean limits. The cleanup threshold established by USEPA was 5 picoCuries per gram (pCi/g) of total radium (Ra-226 + Ra-228) above the background radium activity, which was specified by USEPA as 2.1 pCi/g. Thus, the cleanup threshold for this site is 7.1 pCi/g total radium.

Removal consisted of establishing exclusion zones at each location where elevated radioactivity above the cleanup level was evident. The exclusion zones were marked with paint, and magenta and yellow radiation zone rope was used to delineate the perimeters. Entry into exclusion zones was limited to persons in proper personal protective equipment (PPE), in accordance with the approved Work Plan and Health and Safety Plan.

Removal began in the identified areas in Slip E, the south slip. Material was loaded directly into the shipping containers. Some of the excavations extended beyond the previously identified limits of the radiologically impacted materials. Figure 8 shows the limits to which the Phase II exclusion zones extended in order to reach clean limits.

In Slip E, one location exhibited radiological impacts that extended beneath the groundwater table. Additional exploration and documentation was required to demonstrate that all impacted material had been removed. That demonstration and discussion is described in Section 4.1.

Following remediation in Slip E, the removal effort moved to exclusions zones in and adjacent to the north slip, Slip D. Figure 8 shows the limits to which the Phase II exclusion zones in Slip D extended to reach clean limits. Several locations in Slip D also extended to depths slightly below the water table. However, the soils in Slip D at those locations were generally clay and provided sufficiently slow infiltration so as to allow the USEPA to conduct their verification surveys following completion of the removal.

### **2.4 Phase III Lift Surveys Radiological Screening and Removal**

The topography of the site consisted of soil mounds that had been constructed as part of the golf course operations. While the site was at approximately the elevation it had been circa 1900, the presence of these mounds provided sufficient cover so as to potentially shield from detection locations where radiologically-impacted material might be present above the 1900 elevation. The Lindsay Light facility operated in the vicinity in the early 1900s through approximately 1936. Thus, areas with fill above the

1900 elevation could have contained radiologically-impacted material from the Lindsay Light operations. As a result, those areas required surveying as they were excavated. Additionally, because soil of a sufficient thickness could provide shielding for material buried at that location, the excavations were conducted in lifts no thicker than 18 inches. Figure 9 shows those areas where fill soil was greater than 18 inches thick above the 1900 site elevation. These areas were the areas surveyed in the Phase III excavation survey effort.

The lift excavation surveys, Phase III, were done by excavating the mounded areas in the described 18" lifts. Surveying included both monitoring the area as it was excavated, and surveying the excavated spoil to confirm no radiologically-impacted material was encountered. The excavation was generally accomplished with a backhoe excavator, and the excavation spoil was moved and spread with a front-end loader.

This Phase III work was limited to the areas outside the slips. The slips were not included as they were filled after the 1900 date, and may have received radiologically-impacted fill to a depth below the site elevation in 1900. The Phase III excavations progressed in approximately 18 inch lifts to elevation 7.5 feet CCD. This elevation is 18 inches above the approximate elevation of the site in 1900. In that Lindsay Light Company began operations after this date, the site elevation at that date limits the depth at which material may be disposed. The exception to this limitation is in the slips, which were filled between 1906 and 1929. Those slip areas are to be surveyed whenever excavation disturbs historical fill material that has not previously been surveyed.

Figure 10 notes those locations where material exceeding the cleanup threshold was encountered during the 18 inch lift surveys as part of Phase III. Those locations represent Phase III exclusion zones where the material was removed to clean limits, and USEPA provided verification sampling and sign off on each location.

## **2.5 Phase III Confirmation Sampling**

Upon reaching the base of the excavated materials at elevation 7.5 feet CCD, samples were taken to confirm the radiological character of the soil. A set of five samples was taken and composited for each 100 foot X 100 foot square or part of a square. These samples were collected and analyzed in an effort to document the material at the base of the excavation. USEPA verification surveys were conducted where there had been documented evidence of material exceeding the cleanup threshold. The samples collected and analyzed from the base of the Phase III excavations were from areas where no

exceedances were noted. As a result, no USEPA verification sampling was performed on those areas. These data document the absence of material above the cleanup threshold.

## **2.6 USEPA Verification Sampling**

In the course of Phase II and III, radiological material exceeding the cleanup threshold was encountered. At each location an exclusion zone was established, and material was removed to clean limits. Upon reaching apparently clean limits and following a "pre-EPA survey and sampling" conducted by STS that showed the area met the cleanup standard, the USEPA was notified. The USEPA mobilized to the site and conducted verification surveys. The exclusion zones were surveyed in areas not exceeding 100 square meters. The areas were the same as the areas sampled as part of the "pre-EPA" survey and sampling effort, and were selected by the Field Team Leader and the Health Physics subcontractor.

Each 100 square meter area was surveyed by USEPA, and five sub-samples were collected from the approximate four quarters and the center of the area. In accordance with the Work Plan SOP-223, Verification Survey, the composite sample was homogenized, screened to minus ¼ inch, and five sub-samples were generated for radiological analysis. If the average of these five sub-samples was found to be less than the cleanup threshold of 7.1 pCi/g total radium, a successful verification form was prepared for USEPA signature, the supporting data and form were faxed to USEPA and upon receipt of the USEPA-signed form, the area was released for backfilling. The signed successful verification forms are provided in Appendix F.

### **2.6.1 Phase II Exclusion Zones**

A total of approximately 17 exclusion zones were identified in the course of the Phase II removal effort (Figure 8). Several of the initially identified locations (Figure 5) coalesced as the excavations progressed. Several others were found as excavating equipment and truck traffic disrupted the soil and exposed shallow impacted material.

### **2.6.2 Phase III Exclusion Zones**

Phase III surveys were limited to the areas outside the former slips. This survey effort found relatively few exclusion zones. All those found were in fairly close proximity to the former slips, and likely resulted from grading of material formerly in the slips. Figure 10 shows the locations of the exclusion zones located during the Phase III surveys.

## **2.7 Dust Control Measures**

Concern for potential fugitive dust resulted in several efforts to limit the potential for dust generation. The Work Plan included a Dust Control Plan.

### **2.7.1 No Stockpiles**

To the extent possible, the excavation and soil handling was done without generating or maintaining soil stockpiles. Of specific concern was the objective to not have any stockpiles of radiologically-impacted soil. All radiologically-impacted soil was loaded directly into shipping containers. In the course of the Phase III excavation, temporary stockpiles of unimpacted soil were generated as material was excavated prior to being spread. This material had been surveyed for radioactivity and found to be un-impacted prior to stockpiling.

### **2.7.2 Delay Clearing and Grubbing**

The construction at the site included site clearing and grubbing (the removal of the vegetation and topsoil over the site). This effort was delayed until the completion of the Phase II removal effort and Phase III had been initiated. This delay assured that the areas known to be impacted remained covered with a vegetation cap as long as reasonably possible. Additionally, the maintenance of the grass cover limited the exposed soil areas which would be subject to wind erosion and dust generation.

When the clearing and grubbing was conducted, the areas were surveyed for radiological impacts following the removal of the topsoil cover. This was in effect, the initial survey of the Phase III 18 inch lift surveys.

## **2.8 Work Plan Changes**

Two changes from the procedures specified in the Work Plan were requested in the course of the work effort. These changes are described in the following sections.

### 2.8.1 Downhole Exploration in Slip E

In Slip E, one location had radiologically impacted soil that extended beneath the water table. In the Phase I exploration, the downhole gamma log at boring number B-3 showed material exceeding the cleanup level at the bottom of the boring at a depth of 10.5 feet. In the course of remediation at location B-3, the soil removal extended to and beneath the groundwater table. After excavating approximately 3 to 4 feet below the water table, the inflow of water and the stability of the excavation sidewalls prevented the survey of the walls and floor to document whether the soil met the cleanup standard. In order to assess whether there was material remaining that exceeded the cleanup standard, a down-hole survey was conducted.

The excavation was backfilled with clean soil to slightly above the water level. Four 3-inch diameter steel casings were placed in 6-inch diameter boreholes drilled at the location of the suspect soil. The borings were then gamma surveyed in 6-inch intervals and the values compared to values indicative of material exceeding the cleanup threshold. The readings were corrected for the steel casing, the presence of the water in the soil and annular space around the casing, and for the separation between the wall of the boring and the casing. No values were found that exceeded the cleanup threshold. USEPA issued a letter dated February 11, 2003 indicating no material exceeding the cleanup standard was identified as remaining at this location and the area was cleared for backfilling (Appendix G). Figure 11 presents the locations of the four casings that were installed and surveyed as part of this verification effort.

### 2.8.2 Sub-Division of Site Regarding Parcels O and P

The initial surveys of the site under the Phase I work scope included all the property identified on Figure 2 out to Columbus Drive. Subsequently two of the westernmost parcels were acquired by other parties. The development of those parcels is likely to proceed independently from the remainder of the site. As a result, certain of the Work Plan tasks, such as the Phase III 18 inch lift surveys, were not completed on those parcels. It was requested that these parcels be addressed separately from the remainder of the site so as not to delay the preparation of this Completion Report. At present, USEPA is considering the option of separating these parcels from the remainder of the site. Figure 12 shows the locations of these parcels at the west end of the site.

## **2.9 Impacted Materials Remaining Off-site Beneath Harbor Drive Sidewalk**

At one location near the southeast corner of the site, removal of radiologically-impacted material extended to the property line. In the course of the removal effort, the excavation extended to and beneath the sidewalk adjacent to the site, along the west side of Harbor Drive at that location. At the risk of undermining the sidewalk, no further excavation was performed, and it was documented that some quantity of material exceeding the cleanup level is present beneath the sidewalk. This material is off the Lakeshore East site and is beneath the City of Chicago sidewalk right-of-way. Measurements of radioactivity for a sample from this location indicate material only slightly above the cleanup threshold of 7.1 pCi/g, with measured activity at 7.28 pCi/g. The approximate extent of the material exceeding the threshold is on the order of 15 to 25 feet along the north-south trending wall of the excavation. The material is on the order of 3 to 5 feet deep on the wall of the excavation.

Plastic sheeting and plywood sheets were placed against the excavation wall to minimize the potential erosion of the material. The extent to the east, underneath the sidewalk, was not explored by Lakeshore East as this material is off-site.

### **3.0 QUANTITIES OF MATERIALS REMOVED**

#### **3.1 Thorium-Impacted Soil**

The Phase II removal and Phase III monitoring and removal efforts, completed March 7, 2003, resulted in identifying and removing 177 containers of radiologically impacted soil from the subject site. These containers were estimated at a unit weight of 20.53 tons per container based on the weights measured on previous removal efforts. A total of 3,633.8 tons were shipped as part of Phases II and III.

This material was transported for disposal to EnviroCare of Utah in Clive, Utah. Manifests for the shipping of this material are included in Appendix N.

#### **3.2 Wood Waste and Rubble Removed**

In the course of the thorium removal effort some debris was generated. This material included wood from the walls along the margins of the former slips, railroad bed ties, concrete debris from buildings formerly on site, as well as large concrete debris used in filling the former slips. The material was frisked for radioactivity. After demonstrating the debris was uncontaminated, the debris was staged for off-site disposal along with materials subsequently generated in the post workplan infrastructure and construction activities.



## **4.0 DIFFICULTIES ENCOUNTERED**

### **4.1 Material Extending Below Water Table in Slip E**

The removal in exclusion zone grid area E-H, 13-19 encountered radiologically-impacted material that extended below the water table (refer to Figure 11). The removal effort was thus constrained by several factors. First, material cannot be loaded into the shipping containers if it contains free standing water because the receiving landfill prohibits disposal of liquids. Thus, the material excavated from below the water had to be temporarily staged on the slope of the excavation to allow the water to drain. Second, the water provides some shielding as well as limiting how close the detector probe can be to the soil, thus reducing the sensitivity with which a determination can be made of whether the material is clean. Additionally, the water makes the side slopes of the excavation less stable, resulting in slumping of material into the excavation.

Upon excavating to what appeared to be clean limits, a revision in the verification method was developed and accepted by USEPA. This method consisted of backfilling the excavation with clean fill, installing 3-inch diameter steel well casings and conducting downhole gamma logging in the area where the suspect material had been removed. Following a series of calculations to correct for the shielding of the water and the annular space of the borings into which the casings had been installed, USEPA concurred that there were no exceedances of the cleanup criteria evident in the downhole data and the exclusion zone was released for backfilling. USEPA correspondence regarding this issue is included in Appendix G.

### **4.2 Material Extending Off Site Beneath Harbor Drive Sidewalk**

At one location, radiologically impacted material was encountered that extended to and beyond the property boundary. Near the southeast corner of the site, along the west side of Harbor Drive, soil exhibiting gamma counts above the cleanup threshold was detected at the property line. Figure 13 shows the location beneath the Harbor Drive sidewalk where material was detected off-site. An effort was made to see if that material could be removed by extending the excavation slightly off-site. However, it became evident that while the measured levels were not high, the continued excavation would potentially undermine the sidewalk. As a result, the excavation side-wall was draped with plastic sheeting and covered with plywood. The length of the zone of material above the cleanup threshold was marked in spray paint along the west edge of the sidewalk. It was not determined how far the impacted material may extend to the east beneath the sidewalk. A sample of the material from the wall of the excavation under the sidewalk measured 7.28 pCi/g. It is not intended as part of this remediation effort to remove this material, as it is off-site in the City of Chicago right-of-way.

#### **4.3 Areas Where No 5-Meter Grid Survey Data Collected**

The initial investigation phase, Phase I, consisted of a 5-meter grid survey of the entire approximately 26 acre Lakeshore East site (STS reports dated September 19, 2001; October 2, 2001). That data was used, along with down-hole radiation survey data (STS report dated February 8, 2002) to identify the locations to be remediated during Phase II.

In reviewing the data for this report, two areas were found to not be covered by the 5-meter grid survey data. The golf course lake continues to be filled with water which effectively precludes conducting of a walkover gamma survey. It is proposed to complete that survey when the lake is drained and the bottom has sufficient time to dry to make the survey feasible. The second area was covered with seasonally ponded water during the time the 5-meter survey was conducted. That location was near the west end of the driving range portion of the former golf operations. This second area was subsequently determined to be at an elevation that did not require lift excavations, as it was at or below the 1900 site elevation. Further, the location was not in an area formerly occupied by a slip. Finally, because the area did not need to be excavated for the Phase III lift excavations and surveys, the area was used to receive fill as the higher areas were excavated and surveyed. It had been covered with this excavated material prior to the initiation of the grubbing and clearing task. As a result, it also was not surveyed in the course of the surveys conducted as part of the clearing and grubbing task.

Recently, this area was used to stage an imported soil stockpile. A soil stockpile of approximately 5,000 cubic yards is located so as to cover this area. Thus, at present, it is not possible to conduct a 5-meter walkover gamma survey to fill in the unsurveyed area. It is proposed to provide that survey when the opportunity is available upon the relocation of the soil stockpile.

#### **4.4 Granite Paving Stones and Elevated Gamma Counts**

In the course of the surveys under Phase III, lift excavation surveys encountered a former roadway at the site that was paved with paving stones. The location where these stone pavers were encountered showed gamma readings of approximately 20,000 counts per minute (cpm). This was the gamma count threshold for indicating an exceedance of the 7.1 pCi/g cleanup level.

In that naturally occurring minerals in granite and other stones used in construction can contain radioactive elements, but not require management as radiologically impacted, an effort was made to assess whether the gamma counts were from the paving stones or from contamination surrounding the

stones. The layer of stones was removed and stockpiled, and the underlying soil surveyed. The gamma count dropped to background levels of approximately 6,000 to 7,000 cpm. The pile of stones was then surveyed and found to be on the order of 20,000 counts, indicating the stones were the source of the elevated gamma counts. USEPA was advised of this, and a request was made to not dispose of these stones as contaminated. USEPA verbally concurred (December 13, 2002 communication with Mr. Fred Micke) that based on the evidence provided, the paving stones could be left on-site as not contaminated. A letter to the USEPA to this effect is included as Appendix G.

## **5.0 ANALYTICAL RESULTS**

### **5.1 Soil Sample Radiological Analytical Results**

#### **5.1.2 Progress Excavation Soil Samples**

Soil samples were collected and submitted for on-site laboratory NUTRANL analysis to document the concentrations of the target cleanup radionuclides in the material being excavated. Samples in this group of analyses ranged from materials below cleanup levels to materials well above the cleanup threshold. The maximum activity measured using the NUTRANL system was 360,000 pCi/g total radium. These progress evaluation samples were used as a confirmation of the field survey results. These samples were collected throughout the progress of the Phase II and III excavation work. The NUTRANL analyses are presented in Appendix H, first by laboratory number which is also a chronological catalogue, and then by location coordinates.

Samples were also submitted for radiological analysis to an off-site laboratory, RSSI in Morton Grove, Illinois. Those analyses were performed by high resolution gamma spectroscopy. At the request of USEPA, the analyses were performed using a Library Energy Tolerance of 1.2 and a Gamma Fraction Limit of 71 percent. Those data are also presented in Appendix H.

#### **5.1.3 Imported Soil Samples**

In accordance with the Work Plan, imported soil was to be subject to radiological analysis. Analyses were to be conducted, at a minimum, on each 10,000 cubic yards imported or for each separate source of borrow. The site did not import soil until near the end of the Phase III survey work, as most of the site had to be excavated for the lift surveys, and no area was available for stockpiling soil. The 5,000 cubic yard currently on-site represents the only imported soil as of the completion of the Phase III work. The radiological analysis for that material is also provided in Appendix H.

#### **5.1.4 Pre-Verification Samples (Phase II, III Exclusion Zones)**

The process of verification of remediation of the exclusion zones under Phases II and III involved the collection and analysis of pre-verification samples to confirm the removal had achieved the required cleanup levels. These samples were collected and analyzed before notifying USEPA to conduct its verification surveys and sampling. The results of the pre-verification samples are included in a separate section of Appendix H.

#### **5.1.5 Phase III Confirmation Samples (Base of Lift Surveys)**

The Phase III lift excavations removed the overlying fill to an elevation approximately 18 inches above the site elevation circa 1900. In that these areas did not, for the most part, exhibit elevated radioactivity, there were relatively few exclusion zones, and USEPA did not perform verification surveys for these areas. In order to provide confirmation of the absence of radiological impacts, these areas were sampled on 100 foot grids, and confirmation analyses run at the on-site NUTRANL system. These data showed no evidence of elevated radioactivity and are included in Appendix H.

#### **5.1.6 USEPA Verification Samples**

USEPA conducted verification surveys and collected verification samples for each exclusion zone identified in Phase II and III. These verification samples were composites of five locations for each exclusion zone area to a maximum of 100 square meters. The five samples forming the composite from each area were then homogenized and five sub-samples were prepared. Those sub-samples were placed in 20 ml vials and analyzed at the NUTRANL on-site laboratory. The analytical results for these sub-samples were used to verify that the cleanup levels had been met, and the closure of each area was then signed off by USEPA. The results of these USEPA verification samples are included in Appendix H. The samples are scheduled to be transferred to USEPA under chain-of-custody for analysis at its contract laboratory. Those data will be included in Appendix I upon completion of the analysis and receipt of the data from USEPA.

#### **5.1.7 Off-Site Laboratory Gamma Spectroscopy Results**

Off-site laboratory analyses were provided on approximately five percent of the analyses, to confirm the results from the on-site NUTRANL analyses. These analyses were provided through RSSI of Morton Grove, Illinois. The analyses were performed by high resolution gamma spectroscopy, and used the 71% Gamma Fraction Limit and 1.2 Library Energy Tolerance in accordance with USEPA specifications. These analyses are included in Appendix H.

## **5.2 Air Monitoring Analytical Results**

### **5.2.1 Site Perimeter Air Monitoring**

Perimeter air monitoring for airborne radioactivity was required whenever excavation of radiologically impacted material was being conducted. This monitoring occurred during the Phase II removal and during remediation of the exclusion zones identified during Phase III.

The Lakeshore East site is sufficiently large that the monitoring of the site perimeter would not characterize the potential airborne contaminants from work at discrete locations within the site. For the Phase II removal in Slip E, the south slip, the area to be remediated was sufficiently small that air monitoring locations were established and remained at those locations for the duration of the removal effort. The monitoring locations were approximately the mid-point of the slip grid boundaries in Slip E. Figure 6 shows the area covered by the air monitoring in the south slip, Slip E. In Slip D, the north slip, the locations to be remediated were sufficiently widespread so as to require the air monitoring stations to be positioned at several locations within the Slip D grid network to be within the 200 feet of the active excavation required by the air monitoring plan. Figure 6 also shows the area monitored in Slip D. Similarly, the widespread distribution of the exclusion zones for the Phase III activities necessitated that area air monitoring equipment be repositioned for each excavation to comply with the air monitoring plan.

The air samples were analyzed the day after the collection and again after four days to allow for the short-lived progeny to decay. No exceedances of the exposure limit for the site perimeter were documented for any day of monitoring. Perimeter air monitoring results are provided in Appendix J.

### **5.2.2 Personal Air Monitoring**

Personal air monitoring (PAM) was conducted for all persons working in exclusion zones and those persons involved in the directing of the loading of material into shipping containers. Additionally, PAMs were utilized for persons involved in the lift surveys under Phase III work, regardless of whether there was evidence of radiologically impacted material. PAM data for radioactivity for both one-day and four-day analyses are included in Appendix J. These data show no exceedances of the allowable exposure limits for this project. Note that additional personal monitoring results are provided in Section 5.5 regarding personnel radiation badge results.

### **5.3 Field Gamma Survey Results**

Field gamma surveys were conducted for any soil excavation where there was potential for radiologically-impacted soil to be buried. This included all areas of the site where there was greater than 18 inches of cover over the site elevation in 1900. That 1900 elevation was established at 6.0 CCD (STS report 32193-YH, January 8, 2002). The following sections describe the specific surveys conducted as part of site excavation activities.

#### **5.3.1 Phase II Exclusion Zones**

The Phase II excavations were the first part of the removal effort, and consisted of the removal of the previously identified radiologically-impacted soil. In that these excavations were limited to areas where radiologically-impacted material was known to be present, each of these excavations comprised an exclusion zone. Gamma surveys were conducted throughout those excavations to assess whether the excavation had reached clean limits. In addition to the gamma surveys, samples were periodically collected and analyzed to confirm the gamma survey findings. Those analytical results are presented in Appendix H. Figure 5 identifies the locations where impacted material had been identified prior to the removal effort. Figure 8 shows the limits of the exclusion zones following the completion of the Phase II effort.

#### **5.3.2 Phase III Lift Surveys**

The Phase III excavation work consisted of excavating the fill soil above elevation 7.5 CCD, which is 18 inches above the site elevation in 1900. The areas subject to this Phase III excavation are shown on Figure 9. In that the radiologically impacted soil may be shielded by a soil cover of more than approximately 18 inches, these Phase III excavations were conducted in 18-inch lifts.

At each 18 inch lift, a survey was conducted to document the gamma readings. These gamma surveys were conducted over a 200 X 200 foot grid laid out on the site construction grid coordinate system. These grids were subdivided into quarters lettered A, B, C, and D in a clock-wise direction from the northwest corner. This grid system is shown on Figure 7.

A maximum gamma reading was recorded for each grid quarter for those areas where there was lift excavations conducted. These grid lift maps are provided in Appendix K. In addition, when the excavation reached the base of the lowest lift, samples were collected for NUTRANL analysis from the

four quarters of each grid to document the activity of the soil at that elevation. These data are in addition to the gamma survey data and are presented in Appendix H.

#### **5.4 Equipment Release Surveys**

Excavating equipment used in the excavation of radiologically-impacted soil was required to be surveyed to confirm they were free of radiological impacts prior to being released from the site. This equipment was limited to the excavation buckets used to excavate and load the impacted material. The remainder of the excavator equipment was not used within the exclusion zones. However, to confirm the absence of impacts the treads and other portions of the equipment where soil had accumulated were surveyed for contamination. For the excavator buckets, wipes were also taken in accordance with SOP 345, and alpha counts were made to confirm the absence of contamination. These survey results are presented in Appendix L.

Several locations were identified where impacted soil above the cleanup level was encountered. Those locations were marked as exclusion zones, the impacted soil was removed to clean limits, verification surveys were conducted by USEPA, and sign off was obtained for each location. The locations of the exclusion zones detected and remediated under Phase III are presented on Figure 10.

#### **5.5 Personnel Radiation Badge Results**

Personnel on site for extended periods during removal operations, and particularly personnel operating in the exclusion zones conducting gamma surveys or sampling, personnel assisting with the loading of the containers, and other persons potentially in contact with radiologically-impacted material were monitored with Optically Stimulated Luminescence (OSL) film badges. Badges were changed each calendar month. No exceedances of the allowable exposures were measured for any personnel on this project. The results of the film badge monitoring are presented in Appendix M. No exceedances of the exposure limit for the site were measured for this project.



## **6.0 CONCLUSION**

### **6.1 Work Completed in Accordance With Approved Work Plan**

The work at the Lakeshore East site under the Phase II and III removal and monitoring efforts has been completed in accordance with the Work Plan approved by USEPA. Any modifications of the work from the specifications in the Work Plan have been approved by USEPA.

### **6.2 No Known Radiological Impacted Material Remains**

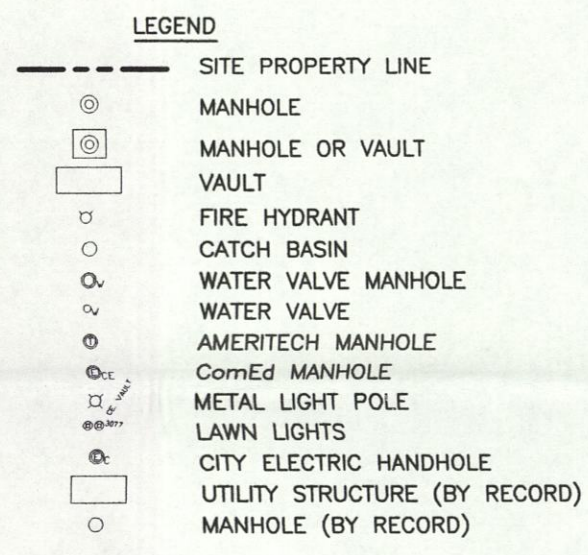
The work completed at the Lakeshore East site included obtaining verification sign off from USEPA for surveys of all of the areas on site where radiologically impacted soil had been identified. The removal of all identified impacted soil and the survey of those portions of the site where fill was sufficiently thick to shield potentially impacted soil from detection results in there being no areas on site where radiologically-impacted soil might remain, with the potential exception of at depths in the slips. Those areas formerly occupied by the slips (Figure 4) are sufficiently deep so as to preclude confirmation that no radiological material remains below the water table. As a result, any excavation that may disrupt historical fill in those areas will require radiation monitoring of the excavation and appropriate management of any impacted soil encountered. The work completed under the Work Plan and as reported in this Completion Report, however, documents that no known impacted material remains on site, either in the former slips or on the remainder of the site.

### **6.3 Request Completion Letter Without Use Restrictions, Except in Slips Where Monitoring Requirement Continues**

On the basis of the Removal Action being completed in accordance with the Work Plan approved by USEPA, and the verification by USEPA that no radiologically-impacted material remains in excess of the cleanup criteria as specified in the Work Plan, areas as described above, STS, on behalf of Lakeshore East LLC, requests that USEPA issue a Notice of Completion for the site confirming that (a) all identified radiologically-impacted materials with levels of radioactivity in excess of the cleanup standards set forth in the Work Plan have been removed from the site as required by the Work Plan, (b) that with the exception of work in the slip areas where monitoring will continue to be required, no further investigation, removal or cleanup action is required with respect to the radiologically-impacted materials, and (c) construction and development work on the site may proceed without further regulatory requirements relating to radiological impacts.







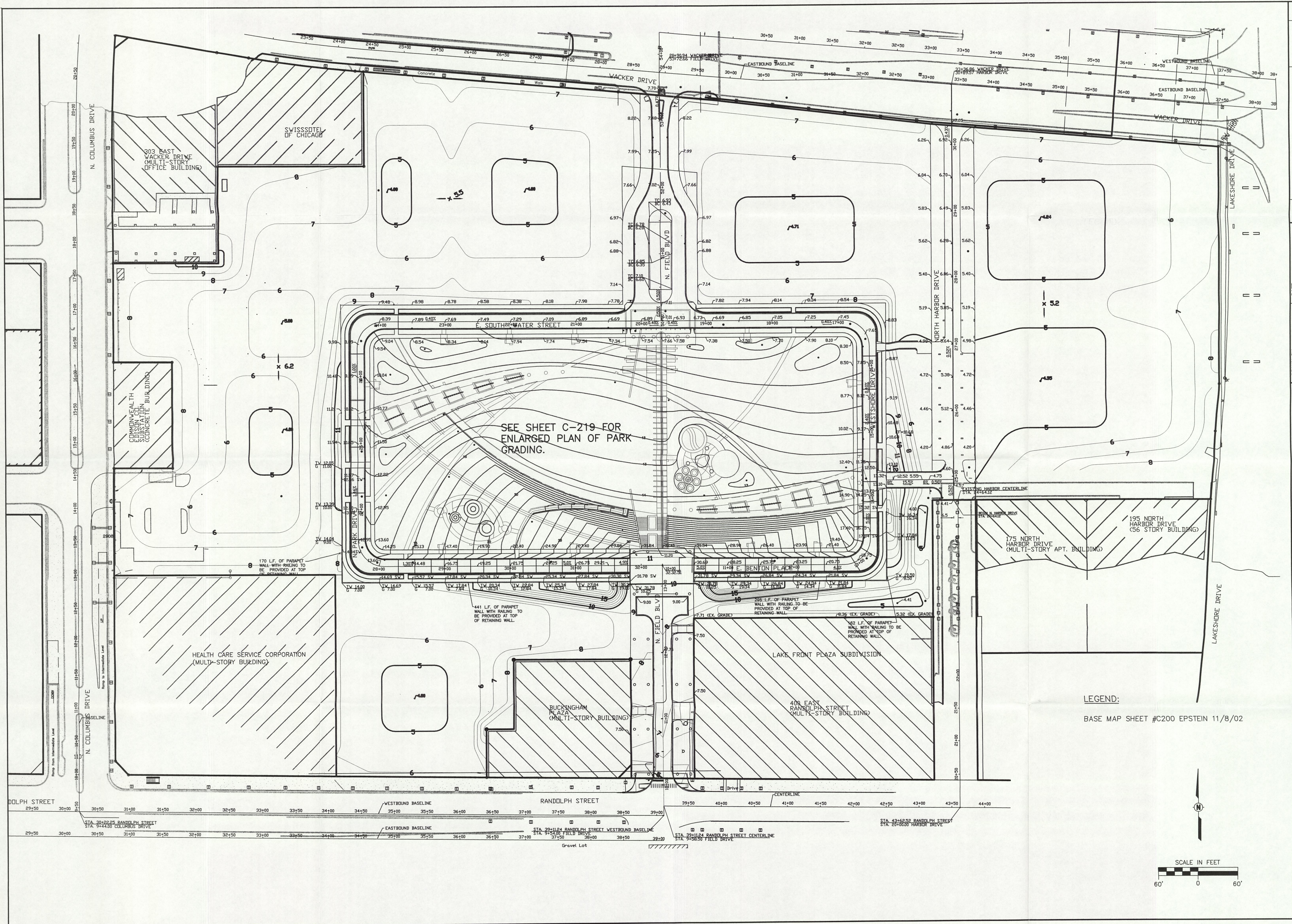
**STS Consultants**


750 Corporate Woods Parkway  
Vernon Hills, IL 60061-3153  
847.279.2500

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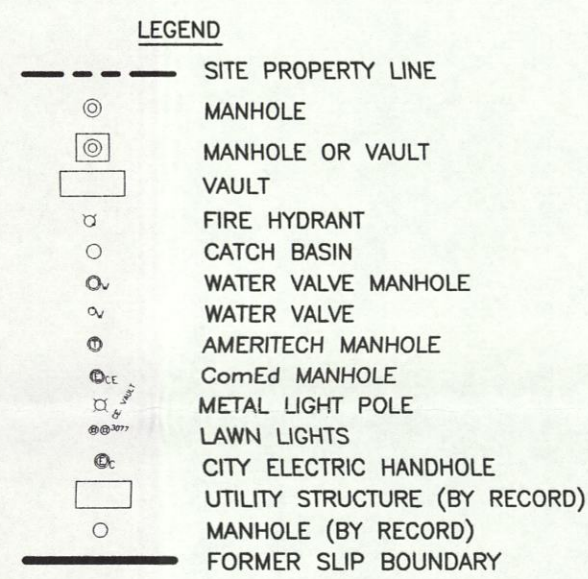
**consultants**  
International Engineering Consultants, Inc.  
188 W. Randolph St. Suite 1826  
Chicago, Illinois 60601  
Tel. (312) 920-9528 / Fax. (312) 920-9570





<div><p>STS Consultants Ltd. Consulting Engineers</p></div>				PROPOSED SITE DEVELOPMENT PLAN LAKESHORE EAST LLC 221 N. COLUMBUS DRIVE CHICAGO, ILLINOIS				DATE		BY	
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						DATE					





NOTES:

1. ALL COORDINATES ARE WITH REFERENCE TO THE COORDINATE SYSTEM AS ESTABLISHED BY THE BUREAU OF ENGINEERING OF THE CITY OF CHICAGO, ILLINOIS, BASED ON A BEARING OF NORTH 89 DEGREES 16 MINUTES 07 SECONDS WEST FOR THE NORTH LINE OF EAST RANDOLPH STREET AND A COORDINATE VALUE OF 18442.602 FEET NORTH AND 19503.095 FEET EAST AT THE NORTHWEST CORNER OF EAST RANDOLPH STREET AND NORTH MICHIGAN AVENUE.

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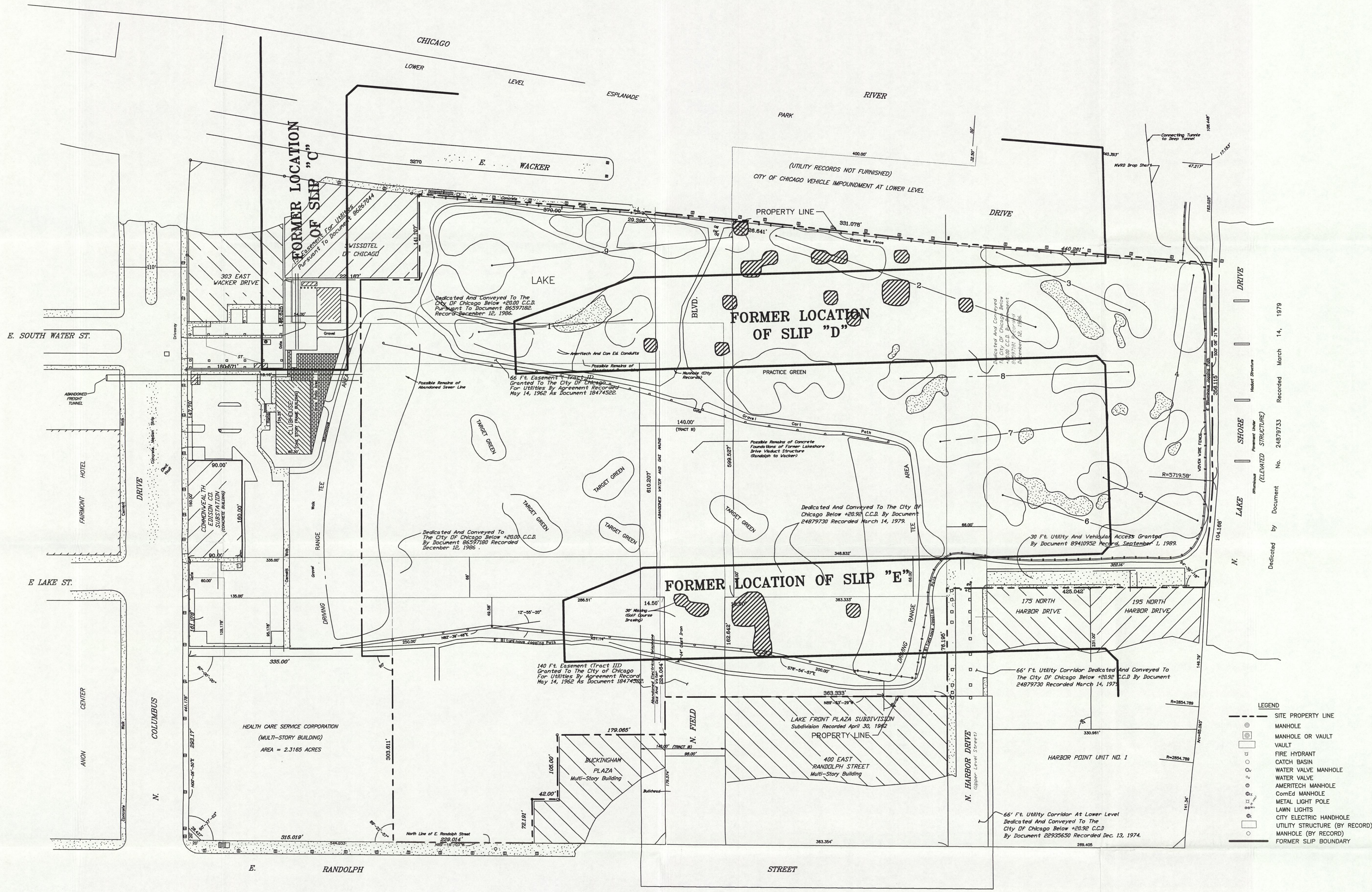


**STS Consultants Ltd.**  
Consulting Engineers

LOCATIONS OF FORMER SLIPS  
LAKESHORE EAST LLC  
221 NORTH COLUMBUS DRIVE  
CHICAGO, ILLINOIS – FALL 2002

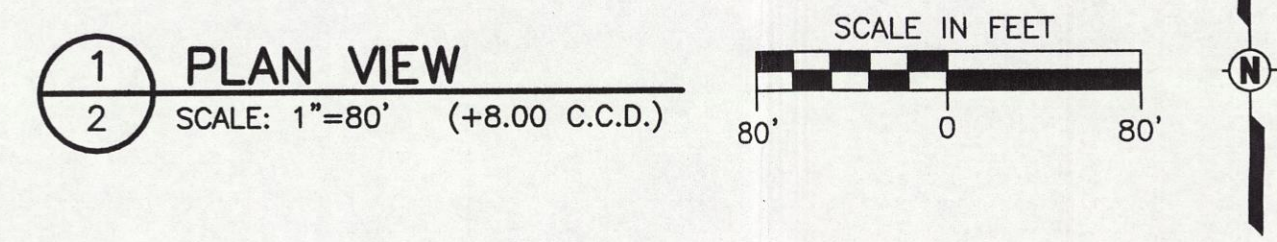
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			REVISION NO.	DATE	BY






BASEMAP SHOWING FORMER GOLF COURSE  
FROM I.E. CONSULTANTS, SEPTEMBER 16, 2002

**ie**  
International Engineering Consultants, Inc.  
188 W. Randolph St. Suite 1806  
Chicago, Illinois 60601  
Tel. (312) 928-9528 / Fax. (312) 928-9570



NOTES:

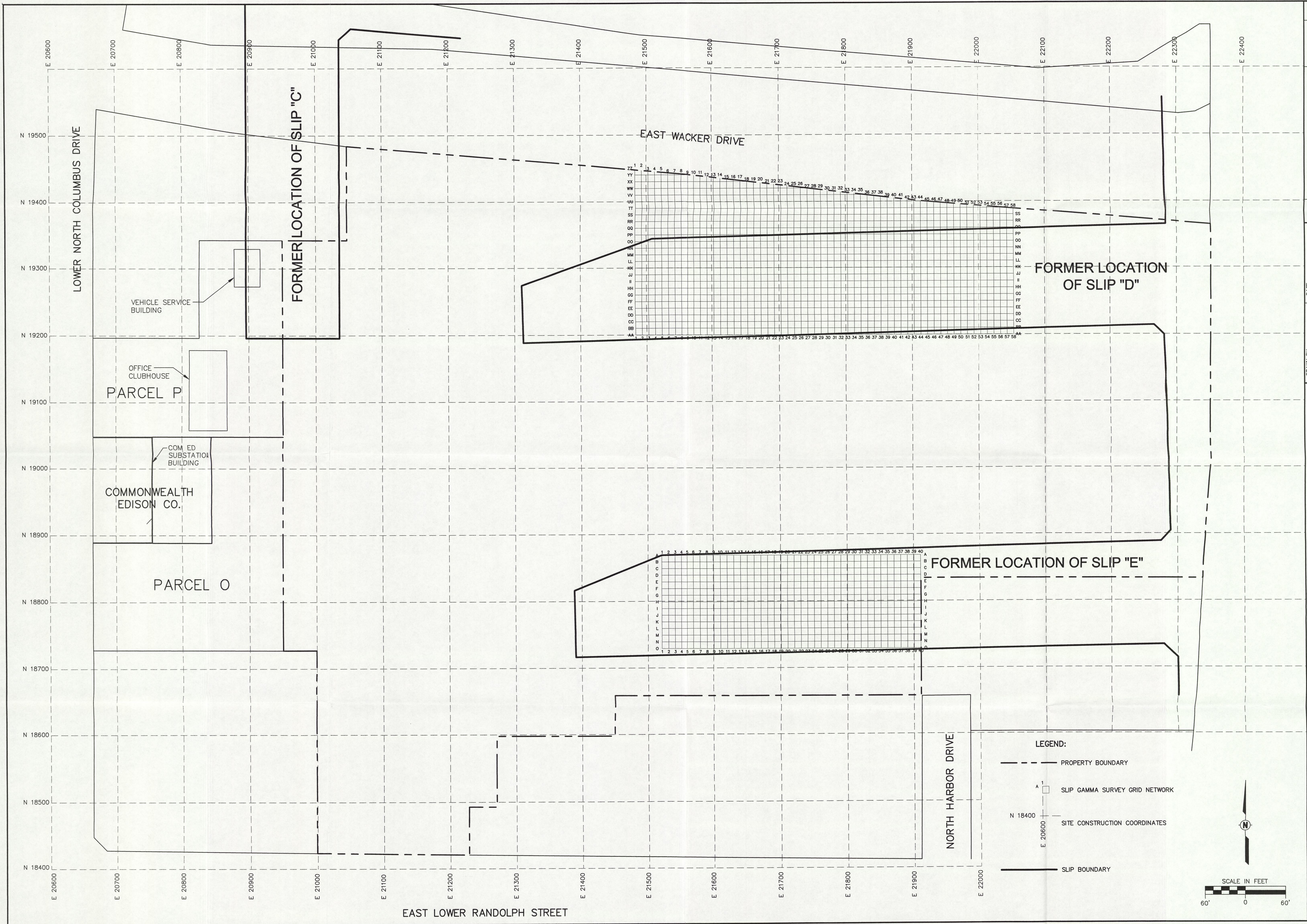
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- ELEVATIONS SHOWN HEREON ARE WITH RESPECT TO CHICAGO CITY DATUM.

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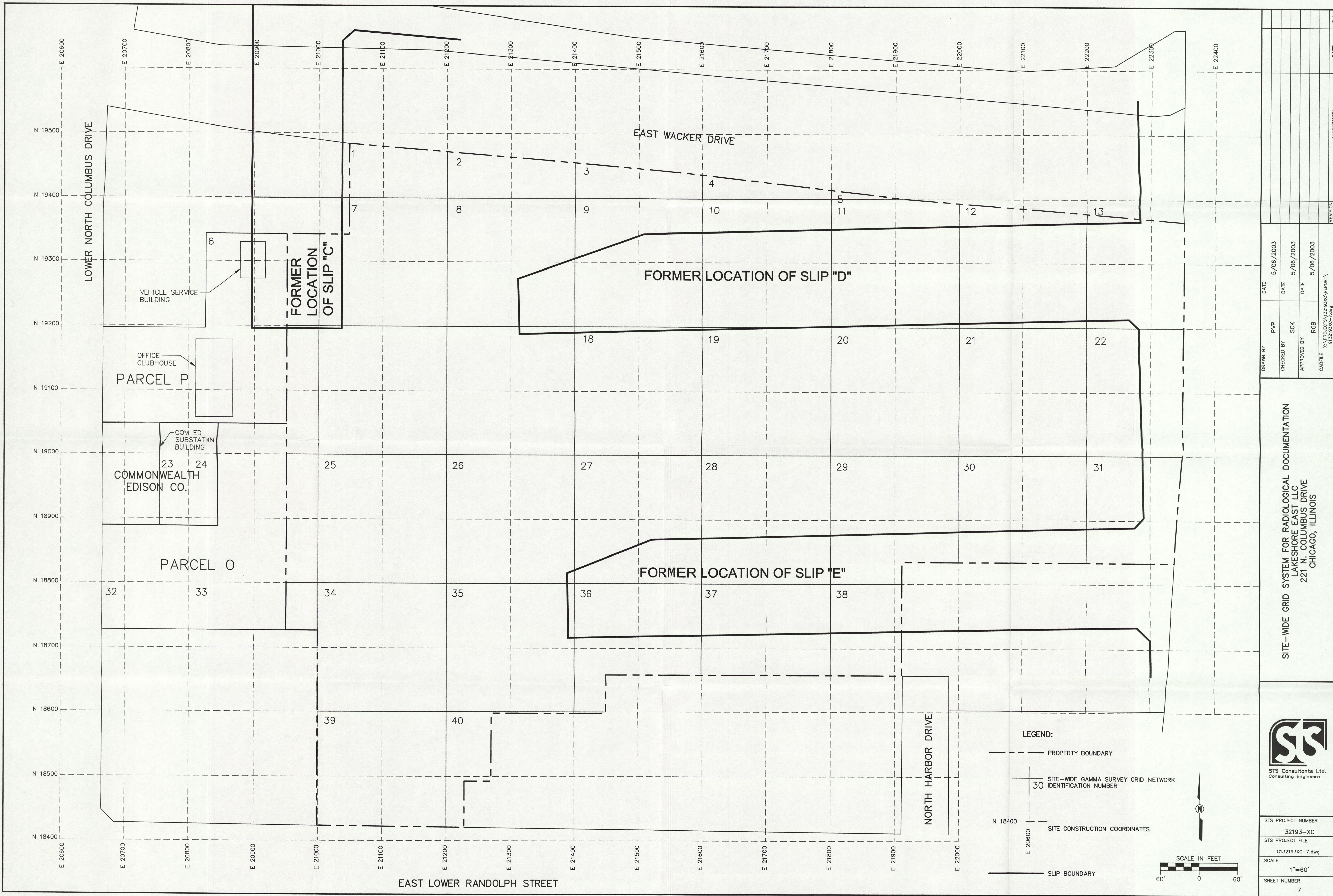


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DATE			



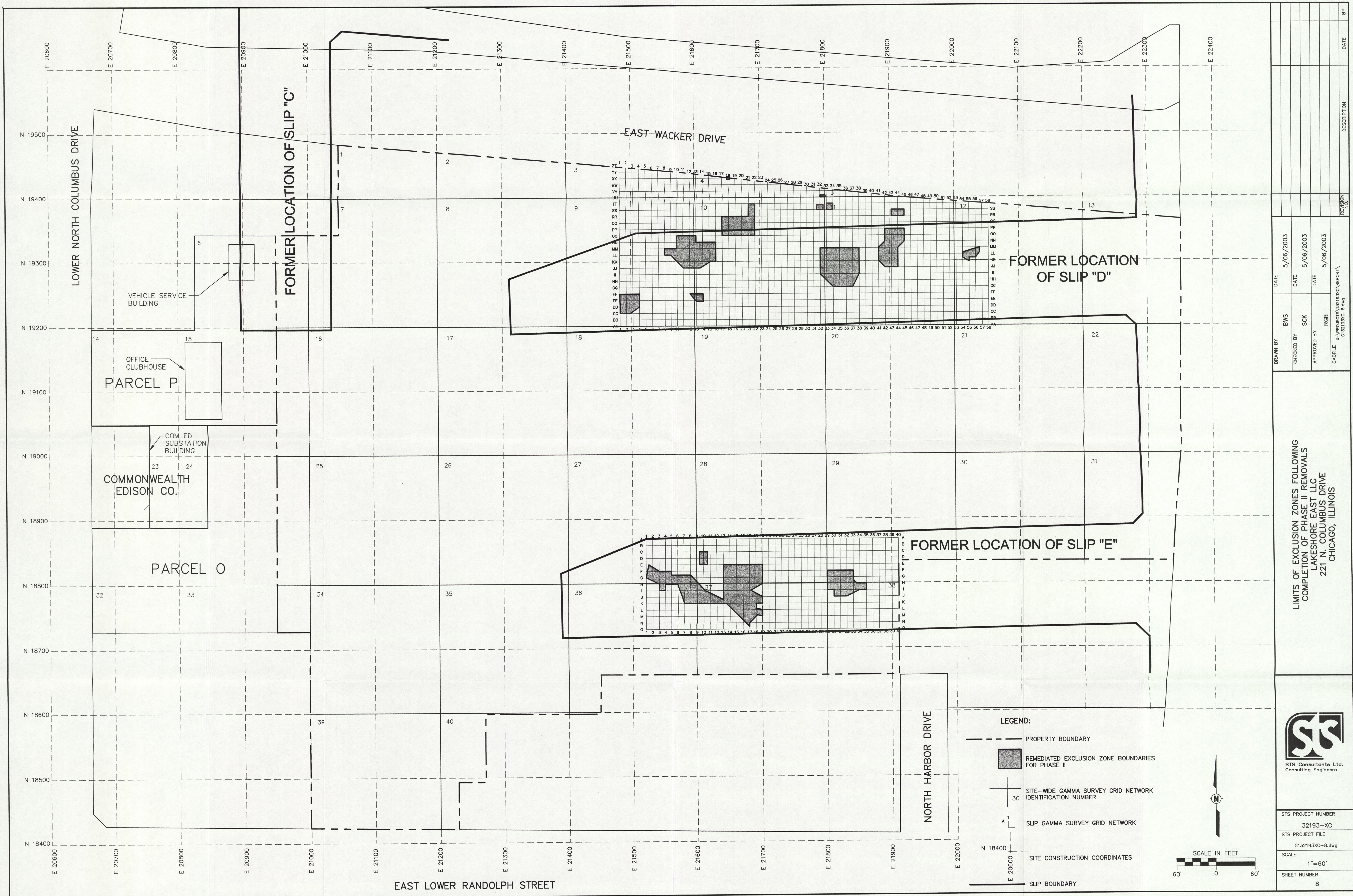
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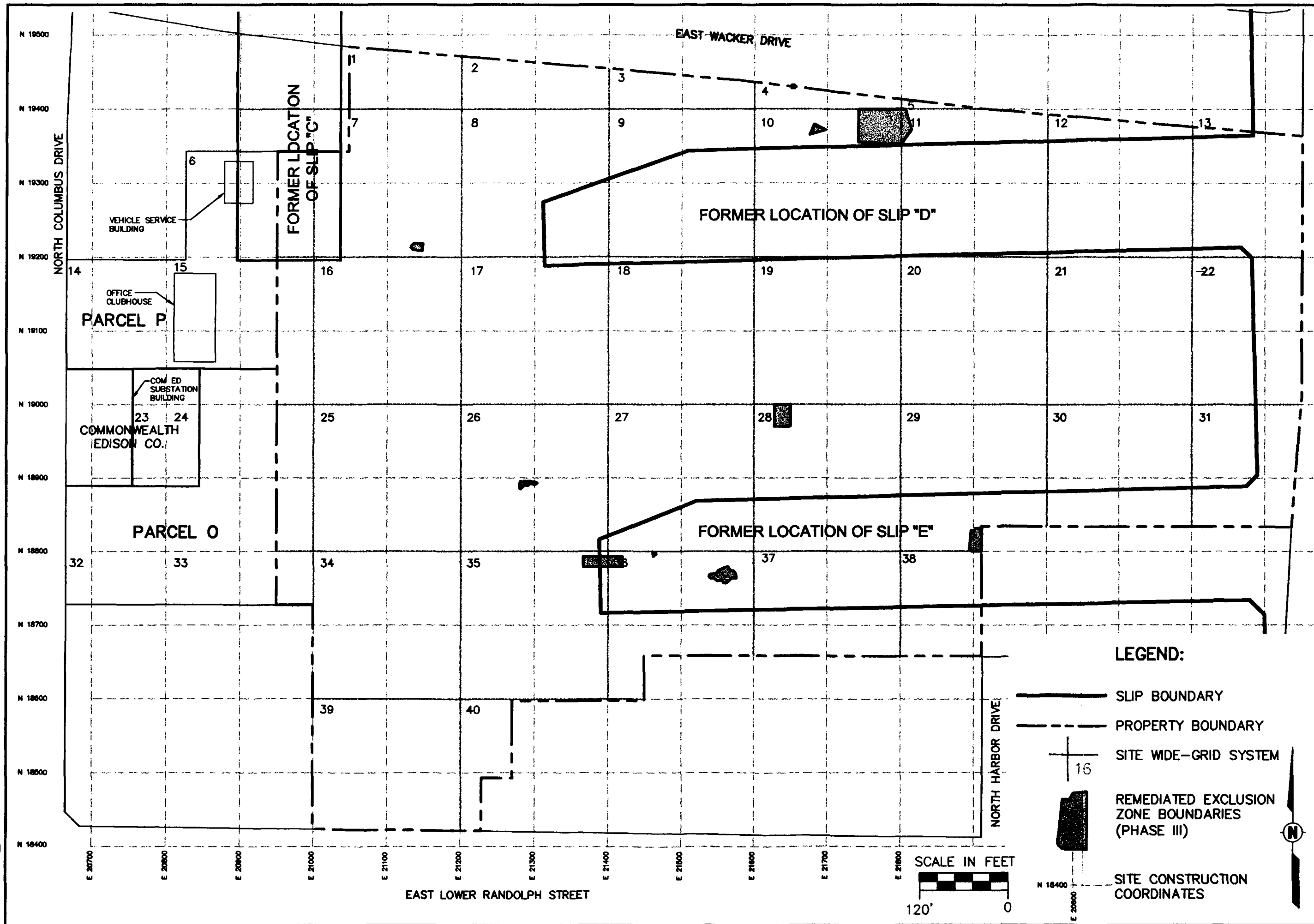












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**LIMITS OF EXCLUSION ZONES ENCOUNTERED DURING PHASE III 18 INCH LIFT SURVEYS**

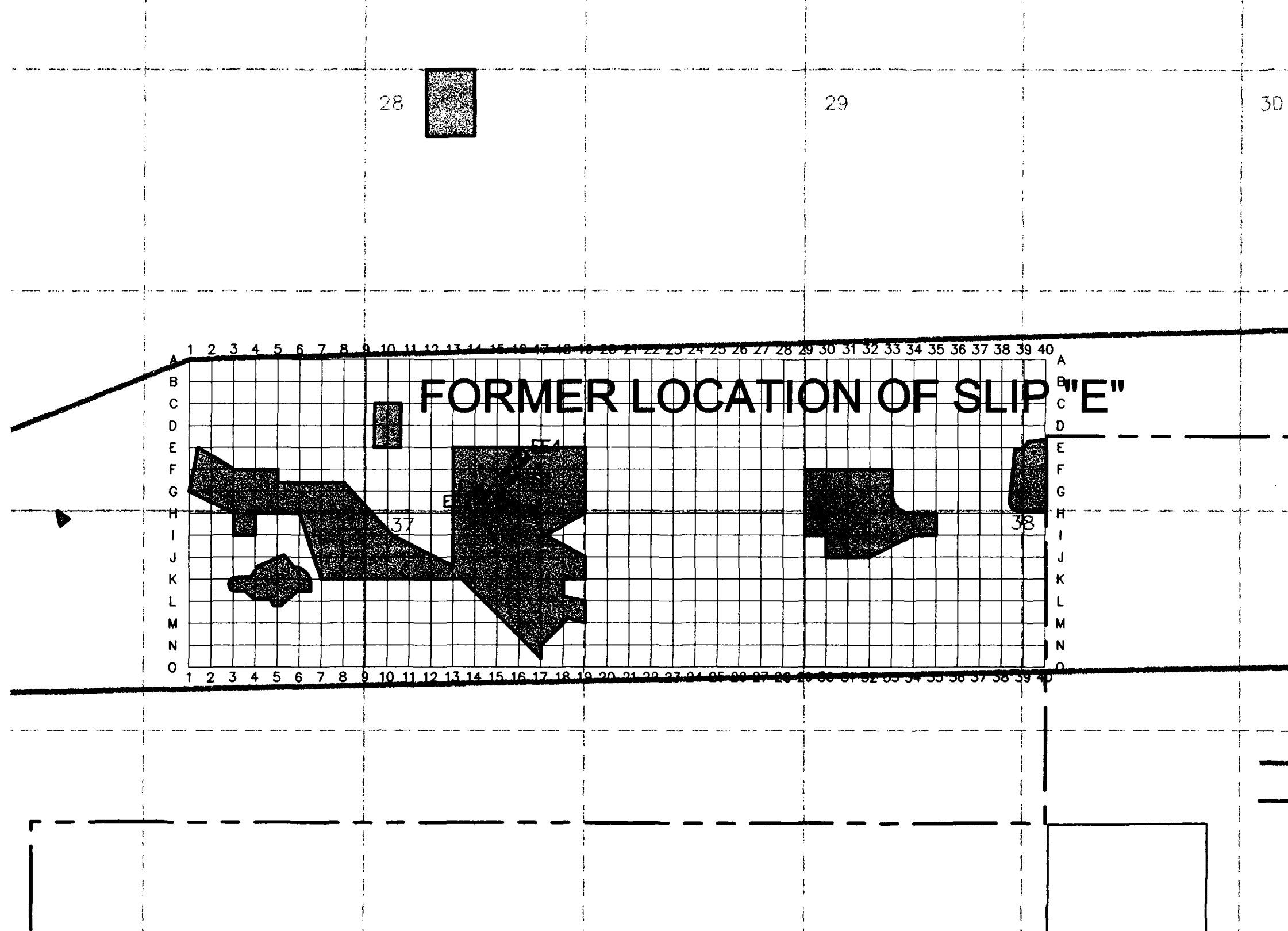
**LAKESHORE EAST LLC**

**221 NORTH COLUMBUS DRIVE**







**CHICAGO, ILLINOIS**

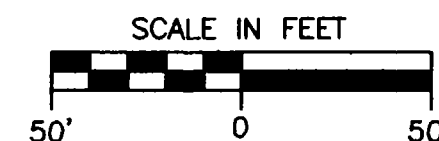
**STS**

STS Consultants Ltd.  
Consulting Engineers



# LEGEND:

-  SLIP BOUNDARY
-  PROPERTY BOUNDARY
-  SLIP GAMMA SURVEY GRID NETWORK
-  SITE WIDE-GRID SYSTEM
-  REMEDIATED EXCLUSION ZONE BOUNDARIES (PHASE II AND III)
-  SOIL BORING

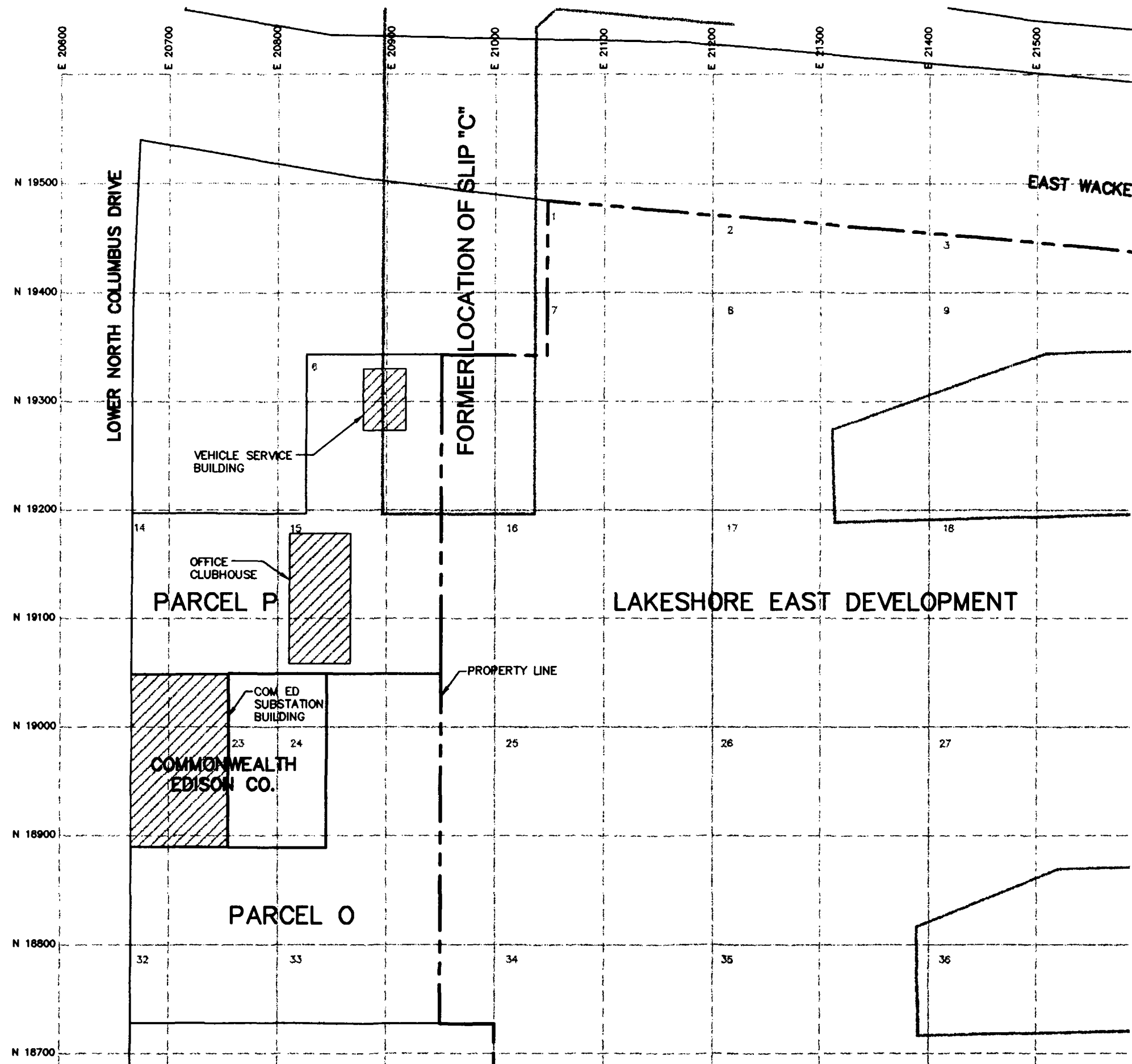


LOCATIONS OF BORINGS PROVIDING  
DOWN-HOLE VERIFICATION IN SLIP E  
LAKESHORE EAST DEVELOPMENT LLC  
221 NORTH COLUMBUS DRIVE  
CHICAGO, ILLINOIS

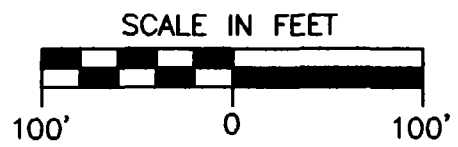


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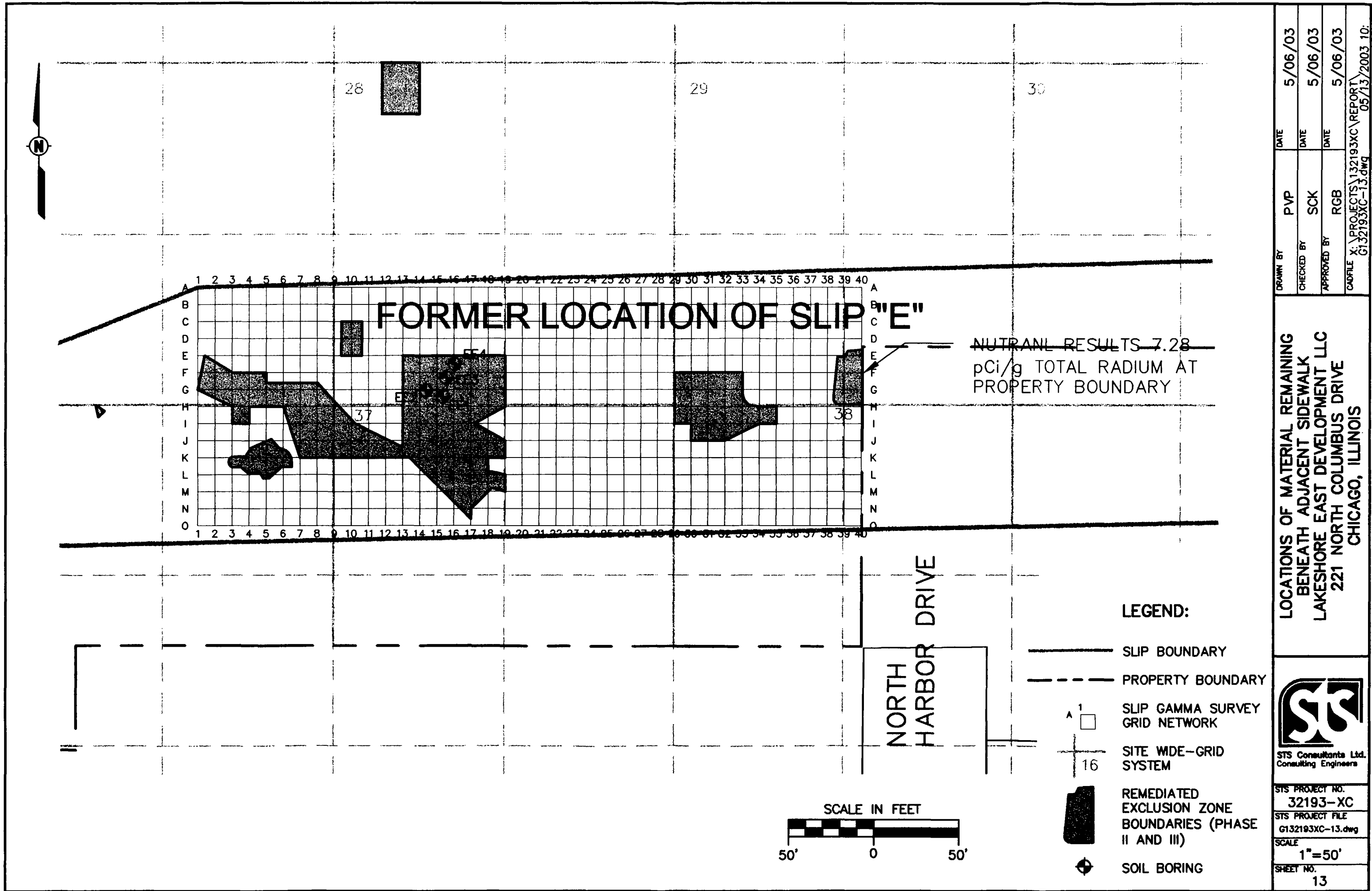


- LEGEND:**
- SLIP BOUNDARY
  - PROPERTY BOUNDARY
  - EXISTING STRUCTURE
  - SITE WIDE-GRID SYSTEM
  - SITE CONSTRUCTION COORDINATES



LOCATIONS OF PARCELS O AND P LAKESHORE EAST LLC 221 NORTH COLUMBUS DRIVE CHICAGO, ILLINOIS				DRAWN BY	PVP	DATE	5/06/03
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LOCATIONS OF MATERIAL REMAINING  
BENEATH ADJACENT SIDEWALK  
LAKESHORE EAST DEVELOPMENT LLC  
221 NORTH COLUMBUS DRIVE  
CHICAGO, ILLINOIS



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## APPENDIX A

### USEPA Action Memorandum





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

MEMORANDUM

DATE: JUL 17 2002

SUBJECT: ACTION MEMORANDUM - Determination of Threat to Public Health or the Environment and Need for Time Critical Removal Action at the Family Golf Course/Lake Shore East Site Chicago, Cook County, Chicago, Illinois (Site Spill ID #05YT)

FROM: *Verneta Simon* *Fam*  
Verneta Simon and Fred Micke, On-Scene Coordinators  
Emergency and Enforcement Response Branch - Section III

TO: William E. Muno, Director  
Superfund Division

THRU: Richard C. Karl, Chief *R. Karl*  
Emergency Response Branch

I. PURPOSE

The purpose of this Memorandum is to document the determination of an imminent and substantial threat to public health and the environment posed by radioactive materials present at portions of the Family Golf Course/ Lake Shore East Site, presently a driving range and golf course and the proposed site of a major 26 acre mixed-use development including residential, commercial, educational, and recreational areas that is slated for construction during the summer of 2002. The site is located at approximately 221 North Columbus Drive in Chicago, Illinois. There is a period of less than six months available before cleanup activities must begin at this site consequently this must be characterized as a time-critical removal that we anticipate will be carried out by potentially responsible parties or the buyer.

In July and August 2001, both the current owners and future prospective buyer of portions of the parcel conducted surveys for gamma radiation and sampled subsurface soils, following U.S. EPA's walk-over survey on June 19, 20, and 29, 2001 that had



shown several areas of elevated gamma radiation. The property owners and the purchasers provided U.S. EPA with the sampling results of the radioactive materials discovered at the property. In the Streeterville area, on the north perimeter of the Chicago Loop, U.S. EPA has ordered two major removal actions since 1993 involving radioactive thorium and another is planned for the summer of 2002. The contaminant of concern at the Family Golf Course/Lake Shore East Site is also thorium and based on the proximity of the contamination to Lindsay Light, the dates of Lindsay operation and the dates of filling activities in the former ship slips along the Chicago River, its likely original source was the Lindsay Light Company, a Streeterville thorium processor and gas mantle manufacturer in the early third of the 1900's.

This site is not on the National Priorities List (NPL).

## **II. SITE CONDITIONS AND BACKGROUND**

**CERCLIS ID # N/A**

Currently, 221 North Columbus Drive is a driving range and nine-hole golf course. In the future, it will become a mixed-use residential neighborhood for 30,000 people.

Details about the Lindsay Light sites in Streeterville are provided in previous Action Memoranda dated July 11, 1994, October 5, 1995, April 22, 1996, and September 22, 1999, which describe site conditions and background.

Sampling results obtained by both buyer and seller are contained in its entirety in the Administrative Record. Sampling has demonstrated that thorium is present at levels substantially exceeding the clean-up criteria for the Streeterville Lindsay Light Sites, 7.1 picocuries per gram (pCi/g) total radium (Ra-226 + Ra-228). In the non-EPA soil samples, the site background was about 2 picocuries per gram total radium (radium-226 + radium-228) while the peak concentration was about 190 pCi/g total radium. In the non-EPA survey, the site gamma count rate background was about 6500 counts per minute while the peak level was about 625,000 counts per minute.

An Action Memorandum is deemed necessary to address an imminent and substantial endangerment to human health and the environment by ensuring proper management of the thorium wastes. At other Lindsay Light Sites, U.S. EPA oversight assured Work Plans, Quality Assurance Plans, and Health and Safety Plans were developed and implemented expeditiously and thoroughly. It assured surveillance and verification was conducted according to protocols deemed most appropriate by U.S. EPA. For this site, U.S. EPA oversight also would ensure defensible laboratory protocols by contractors.

With such a large and complex project, potentially involving so many parties, it is best to resolve the radiation issues early and with thoroughness so that they do not arise as major obstacles later in the development. The Action Memorandum is an effective means of assuring early resolution.

Therefore, it is necessary to enter into an Administrative Order with the sellers and/or buyer to assess the extent of contamination and then to undertake remediation prior to construction. For this particular site, it was not recommended to pursue remediation and construction simultaneously because past experience at the Grand Pier Lindsay Light II removal site indicates that concurrent construction and remediation required additional agency resources and created health and safety risks that required additional management efforts.

An environmental justice (EJ) analysis was performed for this site and is contained in Attachment 3. In Illinois, the low-income percentage is 27 % and the minority % is 25. To meet EJ concern criteria, the area within 1 mile of this property must have a population that is twice the state low income percentage or/and twice that state minority percentage. That is, the area must be at least 54% low-income and/or 50% minority. At this site, the low-income percentage is 10.05 % and minority percentage is 19.64%, as determined by Arcview. Therefore, this site does not meet the region's EJ criteria based on the demographics as identified in "Region 5 Interim Guidelines for Identifying and Addressing a Potential EJ Case, June 1998".

### III. THREAT TO PUBLIC HEALTH OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Conditions at the Family Golf Course/Lake Shore East Site may pose an imminent and substantial endangerment to public health or welfare or the environment, based upon factors set forth in the National Contingency Plan (NCP), 40 CFR 300.415 (b)(2).

These factors include:

a) actual or potential exposure to nearby populations, animals, or the food chain from hazardous substances or pollutants or contaminants:

This factor is present at the site due to the presence of elevated gamma count rate readings that were documented by U.S. EPA on June 19, 20, and 29, 2001 to be as high as 625,000 counts per minute. Counts per a minute in uncontaminated areas of the site were generally about 6500 counts per minute.

In addition, construction is planned to begin at portions of this site in July 2002. Construction and utility workers may be exposed to these contaminants.

b) high levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate:

During July and August 2001, soil samples were collected by the Site sellers and buyer and the highest sample result as of the preparation of this Action Memorandum was 190 picoCuries per gram (pCi/g) total radium including a background level of about 2 pCi/g. The clean-up level applied to the Lindsay Light Sites directly across the Chicago River was 7.1 pCi/g total radium, including background.

c) other situations or factors which may pose threats to public health or welfare or the environment:

Thorium contamination was detected across the Chicago River in at least four locations and possibly two more locations, and under the streets and sidewalks in the "Streeterville" neighborhood on the North side of the Chicago river. There is reason to suspect additional contamination exists since 221 North Columbus is a

former Illinois Central Railroad yard that may have received shipments of thorium-containing ores for Lindsay Light and had four boat slips that were filled during the period of Lindsay Light operation. A book, They Built Chicago by Miles L. Berger, has a 1936 photograph showing the slips at 221 North Columbus.

#### **IV. ENDANGERMENT DETERMINATION**

Given the nature of the Site, the nature of the contaminants - radioactive materials are carcinogens where the health detriment is caused by external exposure, inhalation, ingestion, and direct contact hazards, as described in Sections II and III and the actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action described in this Action Memorandum, may pose an imminent and substantial endangerment to public health, or welfare, or the environment due to these radioactive materials.

#### **V. PROPOSED ACTIONS AND ESTIMATED COSTS**

Pursuant to an Administrative Order, the Site sellers and/or buyer will fully remediate the site until maximum protectiveness of the human health and the environment is achieved. This will involve at a minimum the following actions.

- 1) Develop a Work Plan for the radiological assessment of the site.
- 2) Develop a Quality Assurance Plan.
- 3) Develop and implement a radiological site health and safety plan.
- 4) Conduct land surveying to the extent necessary to establish a grid system to locate all property boundaries, special features (pipes, storage tanks, etc.), and sample locations.
- 5) Place borings in critical locations (grid corners, high exposure rate areas, special features, etc.) for the purpose of measuring subsurface radiation levels. Measurements shall be recorded at each 6 inch depth until the natural soils are

reached or radiation levels reach background, whichever is the greatest depth.

- 6) Collect soil samples from the borings and analyze for radionuclide content and RCRA characteristics. These results will then be used by the PRP or buyer to correlate subsurface radiation levels and radionuclide content.
- 7) Conduct off-site radiological surveying and sampling as necessary and, at a minimum, implement 40 CFR 192 if deemed necessary should extensive contamination be discovered beyond current site boundaries.
- 8) Based upon soil results, remove, transport and dispose of all characterized or identified hazardous substances, pollutants, wastes or contaminants at a RCRA/CERCLA approved disposal facility in accordance with the U.S. EPA off-site rule.

The OSCs have begun planning for the provision of post-removal site control, consistent with the provisions of Section 300.415(k) of the NCP. However, the nature of future response actions should eliminate all exposure threats, which should minimize the need for post-removal site control. Currently, it appears that the contamination is shallow, however, if on-site work demonstrates differently then either a deed restriction or change in design to green space should be implemented.

The response actions described in this memorandum directly address actual or threatened releases of hazardous substances, pollutants or contaminants at the facility which may pose an imminent and substantial endangerment to public health and safety, and to the environment. These response actions do not impose a burden on the affected property disproportionate to the extent to which that property contributes to the conditions being addressed.

#### Applicable or Relevant and Appropriate Requirements (ARARS)

All applicable or relevant and appropriate requirements (ARARS) of federal and state law will be complied with to the extent practicable. The Atomic Energy Act of 1954, section 11(e)(2) defines one type of "by product" as "tailings of wastes produced by the extraction or concentration of uranium or thorium from ore

processed primarily for its source material content." In correspondence dated June 4, 1996, the Illinois Department of Nuclear Safety (IDNS) informed U.S. EPA that its licensing staff had determined that the radioactive material associated with the former Lindsay Light facility located at 316 East Illinois Street in Chicago was "by product" material as defined by Section 11(e)2 of the Atomic Energy Act. The IDNS determination letter is contained in Attachment 1. Such 11(e)(2) by-product material must be disposed of at sites licensed by the Nuclear Regulatory Commission (or NRC-agreement states). In the past, all the radioactive waste from Lindsay Light Streeterville sites has been sent off site for disposal at such licensed sites.

In January 2001, however, the NRC determined if a facility that produced radioactive tailings but was not licensed by NRC or an NRC-agreement state when the Uranium Mill Tailings Radiation Control Act ("UMTRCA") became effective in 1978 or thereafter, then material from a site containing such tailings does not qualify as 11(e)(2) byproduct. The NRC also determined that the AEA does not apply to such "pre-78" (or "pre-UMTRCA") waste, that the AEA does not give the NRC jurisdiction over such waste, and that it does not have to be disposed of at NRC-licensed sites. The thorium tailings associated with the Lindsay Light Streeterville sites were produced from approximately 1904 to 1933 and long pre-date the AEA and UMTRCA. Nonetheless, because the pre-78 tailings have the same radioactive properties as the post-UMTRCA waste, the substantive regulations governing the management of pre-UMTRCA Lindsay Light radioactive tailings are relevant and appropriate requirements for the disposal standards for pre-UMTRCA radioactive tailings.

In light of the January 2001 NRC decision, and in accordance with the revised NCP, Section 300.825(a)(1), U.S. EPA will the request that the State also consider the ARARs and the State's response will be added to the administrative record for this site once the response has been received and evaluated.

#### **VI. CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED**

Delayed or non-action may result in increased likelihood of external exposure, inhalation, ingestion or direct contact to human populations accessing and working on the site. Also, since

there is no threshold for radiological risk, additional exposure to radiological materials will increase the cancer risk.

#### VII. OUTSTANDING POLICY ISSUES

None.

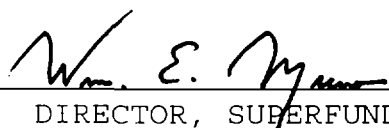
#### VIII. ENFORCEMENT

For administrative purposes, information concerning confidential enforcement strategy for this site is contained in the Enforcement Confidential Addendum.

#### IX. RECOMMENDATION

This decision document represents the selected removal action for the Family Golf Course/Lake Shore East site, in Chicago, Illinois, developed in accordance with CERCLA, as amended, and is not inconsistent with the NCP. This decision is based upon the Administrative Record for this site. Conditions at the site meet the NCP Section 300.415(b)(2) criteria for a removal action.

APPROVE:

  
\_\_\_\_\_  
DIRECTOR, SUPERFUND DIVISION

7/17/02

DISAPPROVE:

\_\_\_\_\_  
DIRECTOR, SUPERFUND DIVISION

Attachments: Enforcement Confidential Addendum

1. Letter Dated June 4, 1996 from the Illinois Department of Nuclear Safety to U.S. EPA
2. Index to the Administrative Record
3. Environmental Justice Analysis

cc: Kevin Mould, U.S. EPA 5202G

Mike Chezick, U.S. Department of Interior, w/o Enf. Addendum

Renee Cipriano, Illinois Environmental Protection Agency,  
w/o Enf. Addendum

Steve Davis, Illinois Department of Natural Resources,  
w/o Enf. Addendum

Naren Prasad, City of Chicago Department of Environment,  
w/o Enf. Addendum

Benet Haller, City of Chicago Department of Planning and  
Development, w/o Enf. Addendum



000003

STATE OF ILLINOIS  
DEPARTMENT OF NUCLEAR SAFETY  
1035 OUTER PARK DRIVE  
SPRINGFIELD, ILLINOIS 62704

Jim Edgar  
Governor

217-785-9900  
217-782-6133 (TDD)

Thomas W. Ortoger  
Director

June 4, 1996

Ms. Verneta Simon  
On-Scene Coordinator  
U.S. EPA Region 5  
77 West Jackson Boulevard  
Chicago, IL 60604-3590

Dear Ms. Simon:

This is in response to your letter of June 2, 1996 relative to the identification of ARARs for the Lindsay Light II Site in Chicago. In August 1995, Kerr-McGee provided this Department additional information concerning the former use of the 316 East Illinois Street facility. Based on that information, our licensing staff determined that the radioactive material is byproduct material as defined in Section 11(e)2 of the Atomic Energy Act.

Given that the contaminant of concern is byproduct material, just like the West Chicago Residential Areas Superfund Site, we suggest that the list of ARARs used for that site would be appropriate for Lindsay Light II as well. That list of ARARs appears in the Final Criteria for Superfund Removal Actions at the Residential Areas Site. This is a November 19, 1993 memo from Regional Administrator Adamkus. A copy is attached for your reference.

Thank you for consulting with us in your development of ARARs.

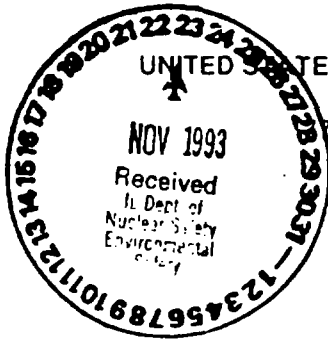
Sincerely,



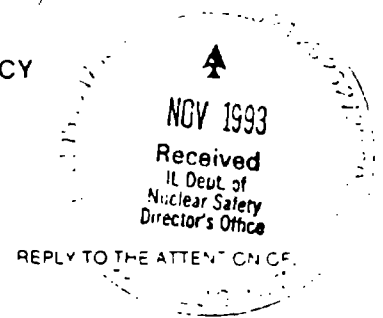
Richard Allen, Manager  
Office of Environmental Safety

RA:mm  
enc.





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 5  
WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590



DATE: November 19, 1993

RE: U.S. EPA's Final Criteria for Superfund Removal Actions  
at the Kerr-McGee Residential Areas Site, West Chicago,  
Illinois

FROM: Valdas V. Adamkus  
Regional Administrator

TO: Addressees

Please find attached a copy of the Final Criteria for Superfund Removal Actions at the Kerr-McGee Residential Areas Site. U.S. EPA will be conducting a public meeting on December 9, 1993, to present the final criteria to the general public. My staff will provide you with details on the public meeting in a separate mailing. If you have any questions concerning the criteria, please feel free to contact me or Rebecca Frey, Remedial Project Manager, at (312) 886-4760.

Valdas V. Adamkus

Addressees

Scott Palmer  
Sen. Doris Karpel  
Rep. Tom Johnson  
Dave Engel  
Don Foster  
Joe Karaganis  
Steven Lakics  
Francis Lyons  
Tom Ortziger  
Dave Ed  
Bill Seith  
Ray Hansen

**ACTION CRITERIA  
FOR SUPERFUND REMOVAL ACTIONS  
AT THE KERR-McGEE RESIDENTIAL AREAS SITE  
WEST CHICAGO, ILLINOIS**

**Prepared by  
U.S. EPA Region 5**

**November 1993**

ACTION CRITERIA  
FOR SUPERFUND REMOVAL ACTIONS  
AT THE KERR-McGEE RESIDENTIAL AREAS SITE  
WEST CHICAGO, ILLINOIS

### Introduction

Under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (commonly known as Superfund), as amended by the Superfund Amendments and Reauthorization Act of 1986, the United States Environmental Protection Agency (U.S. EPA) is authorized, among other things, to take response actions whenever there is a release or threat of a release of a hazardous substance into the environment. The National Priorities List (NPL) is a list of hazardous waste sites across the country that are eligible for U.S. EPA response actions under Superfund.

The U.S. EPA has listed four sites in the vicinity of the City of West Chicago, Illinois, on the NPL. The primary contaminants of concern at these sites are radioactive thorium and its decay products derived from ore processing operations at a factory in West Chicago, now known as the Kerr-McGee Chemical Corporation West Chicago Rare Earths Facility ("factory site"). Three of the NPL sites became contaminated when the processing wastes (thorium mill tailings) were removed from the factory and used primarily as fill material in and around the City of West Chicago. These sites are known as:

- (1) Kerr-McGee (Residential Areas) site,
- (2) Kerr-McGee (Sewage Treatment Plant) site, and
- (3) Kerr-McGee (Reed-Keppler Park) site.

The fourth site became contaminated when discharges and runoff from the factory site traveled via a storm sewer into nearby Kress Creek and downstream to the West Branch of the DuPage River. This site is known as:

- (4) Kerr-McGee (Kress Creek/West Branch of DuPage River) site.

It is important to note that the Residential Areas site may encompass not only residential properties, but also institutional, commercial and municipal properties. Although primarily contaminated because thorium mill tailings were used as fill, some of the properties may have become contaminated due to windblown material from the factory site.

The Kerr-McGee factory site from which the contamination originated has not been listed on the NPL; it is regulated under the licensing authority of the Illinois Department of Nuclear Safety (IDNS). Decommissioning, clean-up and closure of the factory site currently is being addressed under that authority.

### Purpose and Intent

The purpose of this document is to establish criteria for U.S. EPA's response actions at contaminated properties ("Residential Areas") that are not part of the Sewage Treatment Plant, Reed-Keppler Park or Kress Creek/West Branch of DuPage River sites. Those three NPL sites will be addressed by U.S. EPA in separate actions.

It is the intent of the U.S. EPA to address the contamination problems at the Residential Areas by removal actions wherever practicable. Removal actions generally provide more immediate protection than do long-term remedial actions, and are consistent with the movement in the Superfund program to accelerate site cleanups.

U.S. EPA's actions under Superfund will be limited to those properties where the contamination is attributed to process wastes (thorium mill tailings) from the factory site. When naturally occurring radioactive materials not associated with process wastes cause U.S. EPA's action criteria to be exceeded, any corrective actions will have to take place through a separate mechanism, because Superfund generally does not give U.S. EPA the authority to remediate threats from naturally occurring substances.

This document contains the criteria that U.S. EPA will use to designate properties for removal actions and to verify that cleanup to levels protective of human health and the environment has been achieved. The U.S. EPA does not have standardized criteria for removal actions of this type. Consequently, site-specific criteria have been developed by the U.S. EPA in consultation with the IDNS for use at the Residential Areas. The criteria specified in this document will be used during three separate phases of the cleanup action: the **discovery phase**, the **characterization phase**, and the **verification phase**. Each of these phases and the criteria for each are described in detail later in this document. This document also contains release criteria for releasing equipment from work sites for unrestricted use.

#### **Applicable or Relevant and Appropriate Requirements**

Under Superfund, long-term remedial actions must attain Federal and more stringent State "applicable or relevant and appropriate requirements" (ARARs) during and at the completion of the remedial action. Removal actions (such as the type planned at the Residential Areas) must attain ARARs to the extent practicable. Therefore, U.S. EPA relied upon Federal and State ARARs to the extent practicable to establish the criteria in this document.

"Applicable requirements" are cleanup standards or other environmental protection requirements that specifically apply to the substances or activities at the site. In other words, an applicable requirement is one that a private party would have to comply with by law if the same action was being taken apart from Superfund authority.

If a requirement is not applicable, it still may be relevant and appropriate. "Relevant and appropriate requirements" are those cleanup standards that address problems or situations sufficiently similar to those at the Superfund site that their use is well suited to the particular site. A relevant and appropriate requirement must be both relevant to the conditions at the site and appropriate for use at the site, given the circumstances.

If a Federal or State requirement is neither applicable nor relevant and appropriate (and thus not an ARAR), it still may be useful to U.S. EPA when determining the necessary level of cleanup for protection of human health and the environment. Such "to-be-considered" material (TBCs) can include

promulgated regulations that do not qualify as ARARs, and non-promulgated advisories or guidance issued by Federal or State government. Superfund actions are not required to meet TBCs.

Only requirements that are duly promulgated under Federal or State law can be ARARs. Additionally, only substantive requirements of regulations, not procedural requirements, can be ARARs for on-site actions.

The U.S. EPA has identified the following major sources of ARARs and TBCs for the cleanup actions at the Residential Areas:

Title 40, Part 192 of the Code of Federal Regulations (40 CFR 192), entitled "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings" - 40 CFR 192 contains U.S. EPA's standards for cleanup of lands contaminated by uranium and thorium mill wastes. The standards apply only to the sites specifically designated under the Uranium Mill Tailings Radiation Control Act of 1978, but they often have been used as criteria at uranium, thorium and radium sites because of the similarity of the problems. They are not applicable to the Residential Areas, but U.S. EPA considers portions to be relevant and appropriate.

Title 32, Chapter II, Subchapter b, Part 332 of the Illinois Administrative Code, entitled "Licensing Requirements for Source Material Milling Facilities" - These regulations deal with licensing requirements for source material milling facilities in Illinois and apply to the Kerr-McGee factory site in West Chicago. They are not applicable to the Residential Areas, but U.S. EPA considers portions to be relevant and appropriate and portions to be TBCs.

Title 32, Chapter II, Subchapter b, Part 340 of the Illinois Administrative Code, entitled "Standards for Protection Against Radiation" - These regulations establish standards for protection against radiation hazards, primarily in an occupational setting; they control the possession, use and transfer of sources of radiation by "licensees and registrants" so that the total dose to an individual does not exceed specified standards. They also contain decontamination guides for the release of equipment for unrestricted use. These regulations are not applicable to the Residential Areas, but U.S. EPA considers portions to be relevant and appropriate.

DOE Order 5400.5, entitled "Radiation Protection of the Public and the Environment" - This Order establishes standards and requirements for Department of Energy (DOE) operations with respect to protection of members of the public against undue risk from radiation, and contains a discussion of DOE's "ALARA" (As Low As Reasonably Achievable) approach. The Order is not a promulgated Federal or State regulation, and thus cannot be an ARAR, but U.S. EPA considers portions of the Order to be TBCs.

Title 10, Part 20 of the Code of Federal Regulations (10 CFR 20), entitled "Standards for Protection Against Radiation" - These regulations contain the Nuclear Regulatory Commission's standards for protection against radiation, and contain an "ALARA" approach. They are not applicable or relevant and appropriate to the Residential Areas, but U.S. EPA considers portions to be TBCs.

U.S. Nuclear Regulatory Commission's Regulatory Guide 8.37 - This regulatory guide contains, among other things, a discussion of the NRC's "ALARA" approach. The regulatory guide is not a promulgated regulation, and thus cannot be an ARAR, but U.S. EPA considers a portion of the guide to be a TBC.

U.S. Nuclear Regulatory Commission's Regulatory Guide 1.86 - This regulatory guide contains, among other things, decontamination guides for the release of equipment for unrestricted use. The regulatory guide is not a promulgated regulation, and thus cannot be an ARAR, but U.S. EPA considers a portion of the guide to be a TBC.

### The Action Criteria

The remainder of this document describes the different phases of the cleanup action, the specific Federal and State requirements that U.S. EPA considers to be ARARs or TBCs, and the resulting action criteria for each phase of the cleanup action.

### DISCOVERY AND CHARACTERIZATION PHASES

The first phase of the cleanup action is the discovery phase. During this phase, properties in and around the City of West Chicago will be surveyed and sampled to discover and designate those that require cleanup. If a property clearly exceeds the discovery criteria, and if it is clear that the exceedance is due to thorium mill tailings from the factory site, the property will be designated for removal action. If it is not clear whether a property exceeds the discovery criteria (i.e., borderline results), or if it is not clear whether exceedance of the criteria is due to thorium mill tailings, then further investigation will be needed before a decision can be made to designate that property for response action. Such properties will move into the characterization phase.

Because the objective of both discovery and characterization is the same (i.e., to find contaminated properties), the action criteria during these two phases are identical. Properties deemed not to exceed the action criteria during either discovery or characterization will be excluded from further consideration.

Due to the nature of the radiological contamination at the Residential Areas, survey efforts during the discovery phase will consist of measuring and/or sampling the following four parameters: outdoor soil concentration, outdoor

gamma exposure rate, indoor gamma exposure rate and indoor radon/thoron air concentration.

The primary criterion that will be used to designate a property for response action is outdoor soil concentration. The other three parameters (outdoor gamma exposure rate, indoor gamma exposure rate and indoor radon/thoron air concentration) will be used as indicators or "finding tools" to help locate contaminated areas; elevated readings for any of these three parameters alone generally will not trigger a cleanup action unless combined with soil sampling data that exceeds the soil concentration criterion and confirms the presence of thorium mill tailings.

The U.S. EPA has taken a conservative approach with the discovery and characterization criteria in order to minimize the chances of not discovering properties where contamination actually is present. As a result, the discovery criteria may be more stringent than the verification criteria (e.g., for outdoor soil concentrations, the results will not be averaged over 100 square meters during discovery and characterization, but averaging over 100 m<sup>2</sup> may be conducted during the verification phase).

For indoor radon/thoron, the necessity for expeditious surveillance argues for measurements on a shorter time frame than the annual average (or equivalent) associated with the wording of the relevant and appropriate requirement. In order to not unduly delay assessments, discovery and characterization measurement periods may be on the order of 2 days to 3 months. Since weather, seasons and home usage all influence indoor radon/thoron levels, these shorter measurements may not fully characterize the annual average but should be adequate to serve as "finding tools." Also, many homes may have elevated levels of naturally occurring radon that are not associated with the presence of thorium mill tailings on the property. For these reasons, an elevated reading of indoor radon/thoron will not trigger a cleanup action unless combined with soil sampling data that exceeds the soil concentration criterion and confirms the presence of thorium mill tailings.

Discussed below are the criteria that will be used during the discovery and characterization phases of the response action:

- Outdoor Soil Concentration

Soil standards for mill tailings of the type present at the Residential Areas are found in 40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," and at Section 332.150(b) of the Illinois Administrative Code. None of the standards are applicable to the Residential Areas, but portions are relevant and appropriate. Because the State standard is more stringent than the Federal standard (by specifying that the concentration limit is for dry soil), the State regulation is considered as the ARAR.

The State regulation at Section 332.150(b) of the Illinois Administrative Code specifies that the licensed site shall be



decontaminated to the following limits prior to termination of the license:

"Concentrations of radionuclides in soil above background concentrations for total radium, averaged over areas 100 square meters, shall not exceed:

- A) 5 picocuries per gram of dry soil, averaged over the first 15 centimeters below the surface; and
- B) 15 picocuries per gram of dry soil, averaged over layers of 15 centimeters thickness more than 15 centimeters below the surface."

The State requirements in Section 332.150(b) of the Illinois Administrative Code were based on the federal standards in 40 CFR 192.12(a). When the federal standards in 40 CFR 192 were developed over a decade ago, the 5 picocuries per gram (pCi/g) standard was a health based standard, but the 15 pCi/g standard for subsurface soil was technology based, reflecting instrument limitations in locating subsurface deposits. The 15 pCi/g limit is not a health-based standard, and should not be applied to situations in which a health-based standard is appropriate, or to situations that differ substantively from those for which it was derived.

The 15 pCi/g limit was developed as a practical measurement tool for use in locating discrete caches of high activity tailings (typically 300-1000 pCi/g) that were deposited in subsurface locations at mill sites or at nearby properties. The subsurface soil standard in 40 CFR 192 was originally proposed as 5 pCi/g. The final standard was changed, not because the health basis was relaxed, but rather in order to reduce the cost to DOE of locating buried tailings - under the assumption that this would result in essentially the same degree of cleanup at the DOE sites as originally proposed under the 5 pCi/g criterion. The use of a 15 pCi/g subsurface criterion allowed the DOE to use field measurements rather than laboratory analysis to determine when buried tailings had been detected. It is only appropriate for use as a cost-effective tool to locate radioactive waste in situations where contaminated subsurface materials are of high activity and are not expected to be significantly admixed with clean soil. The 15 pCi/g subsurface criterion was not developed for situations where significant quantities of moderate or low activity materials are involved, such as at the Residential Areas site. Therefore, the 15 pCi/g subsurface criterion is not appropriate for use at the Residential Areas site, and thus is not an ARAR. The 5 pCi/g standard, on the other hand, was developed as a health-based standard and is appropriate for use at the Residential Areas site.

Although the soil concentration standard in the regulation is written in terms of an average over an area of 100 square meters, areal averaging will not be conducted during discovery and characterization. This approach is conservative and should minimize the chances of not identifying contamination during the discovery and characterization surveys.

Therefore,

The Discovery and Characterization Criterion for outdoor soil concentrations will be exceedance of 5 picocuries per gram total radium (radium-226 plus radium-228), dry soil, above background in any 15 centimeter depth based upon Section 332.150(b) of the Illinois Administrative Code.

- Outdoor Gamma Exposure Rates

Section 332.150(b) (2) of the Illinois Administrative Code, "Termination of Source Material Milling Facility License," deals with a site licensed by IDNS that is to be decontaminated for license termination. It states that the licensed site shall be decontaminated to the following limits prior to termination of the license:

"The level of gamma radiation measured at a distance of 100 centimeters from the surface shall not exceed background."

This regulation applies only to a licensed site, but the requirements are relevant to the Residential Areas since the intent of the standards is to limit public exposure from site-related radioactive materials.

The variability and distribution of naturally-occurring radioactive materials results in a range of normal background levels, even within a small region such as a few mile radius around West Chicago. In part, this originates from variable geological constituents and in part from human actions (such as phosphate fertilization which can add additional radium to the soil). Consequently, there is not a single number that can be said to be "background" for the entire West Chicago region. While not represented by a single number, the normal background levels of gamma exposure rate will fall within a range and in a fairly predictable statistical pattern. Consequently, a statistical method will be applied to both establish background and what is distinctly above background.

Because there are sources unrelated to thorium mill tailings (such as phosphate fertilizers) that could cause elevated gamma readings at the Residential Areas, it is not appropriate to use the background gamma standard during the discovery phase as a strict, single criterion that, in and of itself, triggers cleanup. However, U.S. EPA will use measurements of outdoor gamma exposure rate as a "finding tool" to locate those areas that are statistically distinct from background. Gamma readings found to be statistically distinct from background at a property will be an indication of possible thorium mill tailings contamination. Such areas will, at a minimum, be investigated further. Elevated gamma readings alone generally will not trigger a cleanup action unless combined with soil sampling data that exceeds the soil concentration criterion and confirms the presence of thorium mill tailings.

Because the background gamma standard will be used extensively as a "finding tool" and not as a strict criterion, exposure rates may be measured at varying heights from the ground surface (typically, 0 to 1 meter), depending on detection sensitivities, practicality, and other conditions encountered in the field.

Therefore,

The Discovery and Characterization Criterion for outdoor gamma exposure rate will be the statistical exceedance of background based upon the Illinois Administrative Code, Section 332.150(b)(2).

- Indoor Gamma Exposure Rates

The only promulgated standard that specifically deals with indoor gamma exposure rate is 40 CFR 192.12(b)(2), which states that the objective of remedial action shall be that

"In any occupied or habitable building--...The level of gamma radiation shall not exceed the background level by more than 20 microrentgens per hour."

Gamma ray exposure to 20 microrentgens per hour for a substantial portion of the year could result in an annual dose exceeding 100 millirem, due solely to external exposure to gamma rays. Recommendations by eminent bodies of radiation scientists, and regulations and policies of federal agencies such as the Nuclear Regulatory Commission and the Department of Energy, are to limit doses to members of the general public to less than 100 millirem per year, including both external exposure (from gamma rays) and internal exposure (from inhalation and ingestion). In addition, NRC's regulations at 10 CFR 20, DOE Order 5400.5 and NRC Regulatory Guide 8.37 contain an "ALARA" (As Low As Reasonably Achievable) approach, which sets forth an objective to attain dose levels as far below the dose limits as practicable. Moreover, EPA believes that individual sources of contamination should be kept to a small fraction of the primary limit of 100 millirem per year, and generally sets annual dose standards below a couple of tens of millirems.

As a result of the above considerations, 40 CFR 192.12(b)(2) is not appropriate for use at the Residential Areas site, and thus is not an ARAR.

Although meant to apply to outdoor situations, the gamma exposure rate standard found at Section 332.150(b)(2) of the Illinois Administrative Code is a TBC for indoor gamma exposure rate, since the intent is to limit public exposure to site-related radioactive materials, and since periods of occupancy are higher indoors than outdoors.

As with outdoor gamma exposure rate, normal background values for indoor gamma exposure rate will fall within a range and in a fairly predictable statistical pattern; background is not a single value and must be treated statistically. In addition, different building materials (such as bricks, concrete blocks and granite hearths) that contain naturally occurring radiological materials could cause elevated indoor gamma readings that are unrelated to thorium mill tailings. For these reasons, U.S. EPA will use measurements of indoor gamma exposure rate as a "finding tool" to locate contaminated areas that may be below or alongside the foundations of buildings. Elevated indoor gamma readings alone generally will not trigger a cleanup action unless combined with soil sampling data that exceeds the soil concentration criterion and confirms the presence of thorium mill tailings.

Therefore,

The Discovery and Characterization Criterion for indoor gamma exposure rate will be the statistical exceedance of background, based upon the Illinois Administrative Code, Section 332.150(b) (2).

As with outdoor gamma exposure rate, a statistical method will be applied to both establish background and what is distinctly above background.

- Indoor Radon/Thoron Decay Product Concentrations

Standards dealing with indoor radon decay product concentrations are found at 40 CFR 192.12(b) (1), which states that:

"In any occupied or habitable building-- The objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL. In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL..." (WL, or working levels, is a measure of the concentration of radon decay products.)

While radon-222 (commonly known just as radon) is produced from the Uranium Decay Series, radon-220 (commonly known as thoron) is the Thorium Decay Series form of radon. 40 CFR 192.40(b) states that the provisions of the standard applicable to radon also apply to thoron. U.S. EPA interprets the radon decay product concentration of 0.02 WL at 40 CFR 192.12(b) (1) to represent the combined (total) concentration of decay products from both radon and thoron.

In the absence of the thorium mill tailings, naturally-occurring decay product concentrations consist primarily of radon, with thoron decay product levels at about 25% to 50% of those of radon. However, since the thorium decay series radionuclides dominated in the ores used at the factory site, it is reasonable to assume that contaminated properties may show elevated levels of thoron if tailings are located below or

alongside the foundation of a building. However, because of different half lives in the thoron decay series, and depending on the location of the tailings, not every contaminated property will show elevated levels of thoron.

Due to the need for expeditious surveillance, measurements during the discovery and characterization phases will occur over a shorter time frame than the annual average (or equivalent) associated with the wording of the relevant and appropriate requirement. In order to not unduly delay assessments, discovery and characterization measurement periods may be on the order of 2 days to 3 months. Since weather, seasons and home usage all influence indoor radon/thoron levels, these shorter measurements may not fully characterize the annual average but should be adequate to serve as "finding tools."

As with outdoor and indoor gamma exposure rate, there is a natural variability in the range of indoor radon/thoron decay product concentrations. Some areas of West Chicago, as in other parts of the country, may have naturally high levels of indoor radon that are totally unrelated to thorium mill tailings. For these reasons, U.S. EPA will use measurements of indoor radon/thoron decay product concentrations as a "finding tool" to help locate contaminated areas that may be below or alongside the foundations of buildings. Elevated indoor radon/thoron decay product readings alone will not trigger a cleanup action unless combined with soil sampling data that exceeds the soil concentration criterion and confirms the presence of thorium mill tailings.

Therefore,

The Discovery and Characterization Criterion for indoor radon/thoron decay product concentrations is 0.02 WL combined radon and thoron decay products (including background) based upon 40 CFR 192.12 (b) (1).

If a property exceeds this criterion due to naturally-occurring radon, and there is no other indication of thorium mill tailings on the property, the property will not be remediated as part of this Superfund action.

- "As Low As Reasonably Achievable" (ALARA)

As discussed above, NRC's regulations at 10 CFR 20, DOE Order 5400.5 and NRC Regulatory Guide 8.37 all contain an ALARA approach which sets forth the objective to attain dose levels as far below the dose limits as practicable. These requirements are TBCs for the removal actions at the Residential Areas.

In addition, Section 340.1000(b) of the Illinois Administrative Code is a TBC for the removal actions at the Residential Areas. Section 340.1000(b), which applies to "licensees and registrants," states,

"In addition to complying with the requirements set forth in this Part, every reasonable effort should be made to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable. The term 'as low as is reasonably achievable' means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of ionizing radiation in the public interest."

The NRC regulations at 10 CFR 20 contain similar language.

As a result, during discovery and characterization, the following ALARA approach will be used for the Residential Areas site:

Every reasonable effort should be made to maintain radiation exposures, and the amount of radioactive materials in unrestricted areas, to levels that are as low as is reasonably achievable.

#### VERIFICATION PHASE

Once a property has been designated for a removal action, the success of the operation must be verified during and at the completion of the removal action. During the verification phase, properties will be surveyed and sampled to ensure that cleanup to levels protective of human health and the environment has been achieved.

As indicated below, some of the verification criteria will be applied during and immediately following the removal action, with surveys and samples collected before the open excavation is backfilled with clean material. Some of the verification criteria will be applied later, with surveys and samples collected after the excavation is backfilled.

The criteria to be used during the verification phase are as follows:

- Outdoor Soil Concentrations

The Verification Criterion for this parameter will be soil concentrations that do not exceed 5 picocuries per gram total radium (radium-226 plus radium-228), dry soil, above background, averaged over areas up to 100 square meters, in any 15 centimeter depth based upon Section 332.150(b) of the Illinois Administrative Code.

Samples for outdoor soil concentrations will be collected before backfilling.

- Outdoor Gamma Exposure Rates

During cleanup of a property, as during the discovery and characterization phases, outdoor gamma exposure rates will be used as a "finding tool" to help determine where additional excavation may be needed. The main criterion to determine when excavation can cease, however, is the outdoor soil concentration criterion.

However, Section 332.150(b) (2) of the Illinois Administrative Code (which requires that, prior to termination of the license, the licensed site be decontaminated so that "The level of gamma radiation measured at a distance of 100 centimeters from the surface shall not exceed background") is relevant to the Residential Areas, and is appropriate for application at the completion of a cleanup action at a property.

Therefore,

The Verification Criterion for this parameter will be outdoor gamma exposure rates that do not statistically exceed background at a distance of 100 centimeters from the surface, based upon the Illinois Administrative Code, Section 332.150(b) (2).

Outdoor gamma exposure rate surveys to verify that this criterion has been met will be conducted after backfilling. A statistical method will be applied to both establish background and what is distinctly above background.

- Indoor Gamma Exposure Rates

For properties that require cleanup and that were found, during discovery and characterization, to have elevated levels of indoor gamma exposure rate due to thorium mill tailings contamination on the property, indoor gamma exposure rate surveys will be used during the cleanup action as a "finding tool" to help determine if additional excavation is necessary.

The Verification Criterion for this parameter will be indoor gamma exposure rates that do not statistically exceed background based upon the Illinois Administrative Code, Section 332.170(c).

For properties that require cleanup, but for which no elevated indoor gamma readings were found during discovery and characterization, indoor gamma surveys will not be conducted during the verification phase.

- Indoor Radon/Thoron Decay Product Concentrations

For properties that require cleanup and that were found, during discovery and characterization, to have elevated levels of indoor radon/thoron decay product concentrations due to thorium mill tailings contamination on the property, additional surveys will be conducted at the completion of the cleanup action to determine if the following verification criterion has been met:

In any occupied or habitable building, the objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) combined radon and thoron decay product concentration (including background) not to exceed 0.02 WL. In any case, the combined radon and thoron decay product concentration (including background) shall not exceed 0.03 WL. (Based on 40 CFR 192.12 (b) (1).)

For properties that require cleanup, but for which no elevated indoor radon/thoron decay product concentrations due to thorium mill tailings were found during discovery and characterization, indoor radon/thoron testing will not be required during the verification phase.

- "As Low As Reasonably Achievable" (ALARA)

In addition to meeting the verification criteria described above, the following ALARA approach will be used during cleanup actions:

Every reasonable effort should be made to maintain radiation exposures, and the amount of radioactive materials in unrestricted areas, to levels that are as low as is reasonably achievable.

#### RELEASE CRITERIA

In addition to the above criteria for discovery, characterization and verification, it will be necessary throughout the project to release equipment from work sites and it may be necessary to assess whether materials or surfaces are suitable for unrestricted use. Requirements for such situations are found in the Illinois Administrative Code, Section 340, Appendix C(a); these requirements are relevant and appropriate for use at the Residential Areas. Similar requirements also are found in the U.S. Nuclear Regulatory Commission's Regulatory Guide 1.86, Table 1; these guidelines are not ARARs (since only promulgated regulations can be ARARs), but the U.S. EPA does consider them to be TBCs.

Both sets of requirements are shown below. Since the requirements are set up with differing units, the most restrictive part for a given situation would be used.



Illinois Administrative Code, Section 340, Appendix C(a)

DECONTAMINATION GUIDES

a) Surface Contamination Guide

Alpha Emitters

Removable	15	pCi per 100 cm <sup>2</sup> =	average over any one surface
	33	dpm per 100 cm <sup>2</sup>	
	45	pCi per 100 cm <sup>2</sup> =	maximum
	100	dpm per 100 cm <sup>2</sup>	
Total (fixed)	450	pCi per 100 cm <sup>2</sup> =	average over any one surface
	1,000	dpm per 100 cm <sup>2</sup>	
	2,250	pCi per 100 cm <sup>2</sup>	maximum
	5,000	dpm per 100 cm <sup>2</sup>	
	0.25 mRem per hour at 1 cm		

Beta-Gamma Emitters

Removable (all beta-gamma emitters except Hydrogen 3)	100	pCi per 100 cm <sup>2</sup>	average over any one surface
	500	pCi per 100 cm <sup>2</sup>	maximum
Removable (Hydrogen 3)	1,000	pCi per 100 cm <sup>2</sup>	average over any one surface
	5,000	pCi per 100 cm <sup>2</sup>	maximum
Total (fixed)	0.25 mRem per hour at 1 cm from surface		

- U.S. Nuclear Regulatory Commission, Regulatory Guide 1.86, Table 1

TABLE 1

## ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDE <sup>a</sup>	AVERAGE <sup>b,c</sup>	MAXIMUM <sup>b,d</sup>	REMOVABLE <sup>b,e</sup>
U-nat, U-235, U-238, and associated decay products	5,000 dpm $\alpha$ per 100 cm <sup>2</sup>	15,000 dpm $\alpha$ per 100 cm <sup>2</sup>	1,000 dpm $\alpha$ per 100 cm <sup>2</sup>
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm per 100 cm <sup>2</sup>	300 dpm per 100 cm <sup>2</sup>	20 dpm per 100 cm <sup>2</sup>
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000 dpm per 100 cm <sup>2</sup>	3000 dpm per 100 cm <sup>2</sup>	200 dpm per 100 cm <sup>2</sup>
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta$ - $\gamma$ per 100 cm <sup>2</sup>	15,000 dpm $\beta$ - $\gamma$ per 100 cm <sup>2</sup>	1000 dpm $\beta$ - $\gamma$ per 100 cm <sup>2</sup>

<sup>a</sup> Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

<sup>b</sup> As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

<sup>c</sup> Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

<sup>d</sup> The maximum contamination level applies to an area of not more than 100 cm<sup>2</sup>.

<sup>e</sup> The amount of removable radioactive material per 100 cm<sup>2</sup> of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

## Criteria Not Chosen for Discovery, Characterization or Verification

Discussed below are other parameters and their associated regulations and standards that were reviewed by U.S. EPA to determine whether they were ARAPs and should be used as discovery, characterization and/or verification criteria. None of these standards is applicable to the removal action and, as explained below, none is relevant and appropriate.

- Outdoor Radon Concentrations

Outdoor radon (radon-222) and thoron (radon-220) are regulated in Section 332.170(b) of the Illinois Administrative Code:

"During the operating life and facility decommissioning, the combined concentration of radon and thoron at the boundary of the licensed site, measured at a height of one meter from the surface, averaged annually, shall not exceed three picocuries per liter above the background concentration at the licensed site."

Even though on its terms the regulation applies only to a licensed facility, the intent of the regulation is to control radon and thoron in off-site areas, since the point of compliance is at the boundary of the licensed site. Therefore, the U.S. EPA considers the regulation to be relevant to the Residential Areas.

However, there are practical reasons why measurements for radon and thoron outdoors will not aid in the identification of contaminated properties not otherwise identified by outdoor gamma exposure rate surveys and outdoor soil concentration samples. These reasons are as follows: (1) Reliable radon and thoron measurements are not immediate, but can take days or weeks to measure good averages. Gamma surveys, on the other hand, can provide instantaneous measurements; (2) Unless the emissions are extremely large, radon and thoron emitted from the ground surface will rapidly mix in the open air, making them indistinguishable from naturally occurring radon and thoron. Large radon and thoron emissions would be associated with large contaminant deposits easily identifiable by gamma survey instruments; (3) Because radon and thoron are gases that can be transported by the wind, it would be much harder to pinpoint the emission site.

Therefore, for the reasons stated above, outdoor radon concentrations (radon and thoron), though relevant, are not appropriate to these circumstances and will not be one of the criteria for this response action.

- Radon Release Rates from Soil

The emission of radon (radon-222) and thoron (radon-220) from soils is regulated in Section 332.170(c) of the Illinois Administrative Code, which states:

"The disposal area shall be designed so that after reclamation and stabilization, the annual total radon release rate through the cover from the byproduct material shall not exceed two picocuries per square meter per second."

This regulation only applies to the disposal area at a licensed facility, but the intent of the regulation is to control the total radon emission to the environment and to protect the general population.

However, Section 332.240(a) of the Illinois Administrative Code states:

"Monitoring for total radon after installation of an appropriately designed cover is not required. Total radon emissions from cover material shall be estimated as part of developing a closure plan."

Since it appears that the State never intended that actual measurements be made to show compliance with the regulation, the U.S. EPA does not consider this regulation to be relevant and appropriate for use at the Residential Areas. In addition, there are other, practical reasons why measurements of radon and thoron emissions from soil would not be an appropriate indicator of contaminants. At the Residential Areas, thoron is the dominant radon isotope of concern. If thoron is produced at a depth of more than a few inches below the ground surface, it will radioactively decay to a solid element and cease moving through the soil before reaching the surface. Soil sampling, on the other hand, will find contaminants at much greater depth, as would gamma exposure rate measurements which penetrate soil depths on the order of several feet.

Consequently, measurements for radon and thoron emission rates will not be conducted during this response action.

#### ● Doses in the General Environment

Thorium-related doses in the general environment are regulated in 40 CFR 192.41(d), which states:

"Operations...shall be conducted in such a manner as to provide reasonable assurance that the annual dose equivalent does not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public as a result of exposures to the planned discharge of radioactive materials, radon-220 and its daughters excepted, to the general environment."

Doses in the general environment also are regulated in Section 332.170(a) of the Illinois Administrative Code, which states:

"At all times, concentrations of radioactive material, excluding radon, thoron, and their progeny, which may be released to the general environment in groundwater, surface water, air, soil, or other means shall not result in a committed effective dose in excess of 25 millirem (0.25 mSv) to the whole body, and a

committed dose equivalent in excess of 75 millirem (0.75 mSv) to the thyroid, and 25 millirem (0.25 mSv) to any other organ of any member of the public."

\* mSv designates milliSieverts, a dose unit equal to 100 millirem.

Neither of the above regulations is applicable to the Residential Areas, but the U.S. EPA considers both to be relevant.

Even though the dose requirements of 40 CFR 192.41(d) and Section 332.170(a) of the Illinois Administrative Code are relevant to the Residential Areas, there are practical reasons why performing dose assessment calculations will not aid in the identification of contaminated properties not otherwise detected by the other discovery criteria. An operational assumption for this response action is that where site parameters such as indoor or outdoor gamma exposure rate, outdoor soil concentrations, or indoor radon and thoron are elevated, dose is elevated proportionally. Therefore, having specific dose calculations is not appropriate as it will not provide useful information not already provided by other parameters. Consequently, no separate dose assessment calculations will be required for this response action.

## ATTACHMENT 2

U.S. ENVIRONMENTAL PROTECTION AGENCY  
REMOVAL ACTIONADMINISTRATIVE RECORD  
FOR  
FAMILY GOLF COURSE/LAKE SHORE EAST SITE  
CHICAGO, COOK COUNTY, ILLINOISORIGINAL  
JUNE 28, 2002

<u>NO.</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
1	07/26/00	Magellan Development, Ltd.	International Engineering Consultants, Inc.	Map: Plat of Survey at Lower Level, Lakeshore East, East of Columbus Drive	1
2	03/30/01	Linnane, S., Magellan Development Group	Simon, V., U.S. EPA	Cover Letter Forwarding the Land Plan, Phase I Environmental Assessment and Geotechnical Report for the Lakeshore East Site	1
3	03/30/01	Simon, V., U.S. EPA	Linnane, S., Magellan Development Group	Letter: Possible Radiological Contamination at the Lakeshore East Site	4
4	04/09/01	Chicago Sun-Times	Public	Newspaper Article: "New East Side" is Old Hat; 'Lakeshore East' Wins Favor"	1
5	05/23/01	Simon, V., U.S. EPA	Linnane, S., Magellan Development Group	Letter re: Consent for Access to Property Form for the Lakeshore East Site	5
6	06/00/01	U.S. EPA	U.S. EPA	Map: Gamma Level Survey of Family Center Golf Course in Downtown Chicago (DRAFT)	1
7	06/14/01	Linnane, S., Magellan Development Group	Simon, V., U.S. EPA	Fax Transmission re: Signed Consent for Access to Property Form for the Illinois Center Golf Course	2
8	07/02/01	Simon, V., U.S. EPA	Linnane, S., Magellan Development Group	Letter re: Lakeshore East Radiation Anomalies	4

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9	07/02/01	U.S. EPA	File	Attendance List for the July 2, 2001 Meeting re: the Gamma Survey at the Family Center Golf Course	1
10	07/03/01	Simon, V., U.S. EPA	Carlins, D., Magellan Development Group	Cover Letter Forwarding Clipboard Data for the Lakeshore East Site	1
11	07/12/01	Martwick, C., U.S. EPA	Smith, J., Covington & Burling	Letter re: Draft Gamma Level Survey of the Family Center Golf Course	1
12	07/12/01	Riggs, J., Consolidated Engineering Services	Simon, V., U.S. EPA	Letter re: Request for Public Information Concerning the Golf Center at 221 N. Columbus Drive	1
13	07/16/01	Linnane, S., Magellan Development Group	Simon, V., U.S. EPA	Letter re: Delineation of Contamination Anomalies at the Lakeshore East Site	1
14	07/26/01	Simon, V., U.S. EPA	Linnane, S., Magellan Development Group	Letter re: Delineation of Contamination Anomalies at the Lakeshore East Site	1
15	07/30/01	Torres, S., & R. Berggreen, STS Consultants, Ltd.	Bezark, S., Alzheimer & Gray	Letter Confirming Agreement for Environmental Gamma Radiation Survey of 26-Acre Site at Lakeshore East w/ Attached General Conditions of Service	12
16	08/02/01	Bezark, S., Alzheimer & Gray	Simon, V., U.S. EPA	Letter: STS Consultants Plans to Conduct Step Out and Down Hole Borings at Lakeshore East	1
17	09/17/01	Warren, A., Michael Best & Friedrich, LLC	Jensen, L., U.S. EPA	August 22, 2001 Report for Survey Activities at 221 North Columbus Drive Performed on July 27 and July 30-August 1, 2001 w/ Fax Transmission Cover Sheet	13

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18	09/19/01	STS Consultants, LTD	Loewenberg and Associates & Illinois Center Plaza Venture	Report re: Radiation Survey, 26-Acre Site, Southwest Corner Wacker Drive and Lake Shore Drive, 221 N. Columbus Drive w/ Appendices, Maps and Cover Letter	171
19	10/01/01	Fulgham, M., U.S. EPA	Warren, A., Michael Best & Friedrich	Letter: Survey Activities at 221 North Columbus Drive	1
20	10/02/01	Torres S. & R. Berggreen, STS Consultants, Ltd.	Lippe, M., Illinois Center Plaza Venture & J. Loewenberg, Loewenberg and Associates	Letter re: Addendum to Report for Results of Expanded Gamma Radiation Survey at 26-Acre Site, 221 North Columbus Drive	4
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22	10/12/01	Reader	Public	Newspaper Article: "This Land is Whose Land: The Uncertain Future of a Prime Patch of Undeveloped Lakeshore Real Estate"	3
23	11/06/01	Simon, V., U.S. EPA	Linnane, S., Magellan Development Group & R. Berggreen, STS Consultants, Inc.	Letter re: U.S. EPA's Review of the Radiation Survey for the 26-Acre Site at the Southwest Corner of Wacker Drive and Lake Shore Drive w/ Attachment	11
24	01/08/02	Torres, S. & R. Berggreen, STS Consultants, Ltd.	Carlins, D., Magellan Development Group, & S. Bezark, Alzheimer and Gray	Letter: Test Pit Explora- tions at 26-Acre Golf Course Site, South- west Corner of Wacker Drive and Lake Shore Drive	3

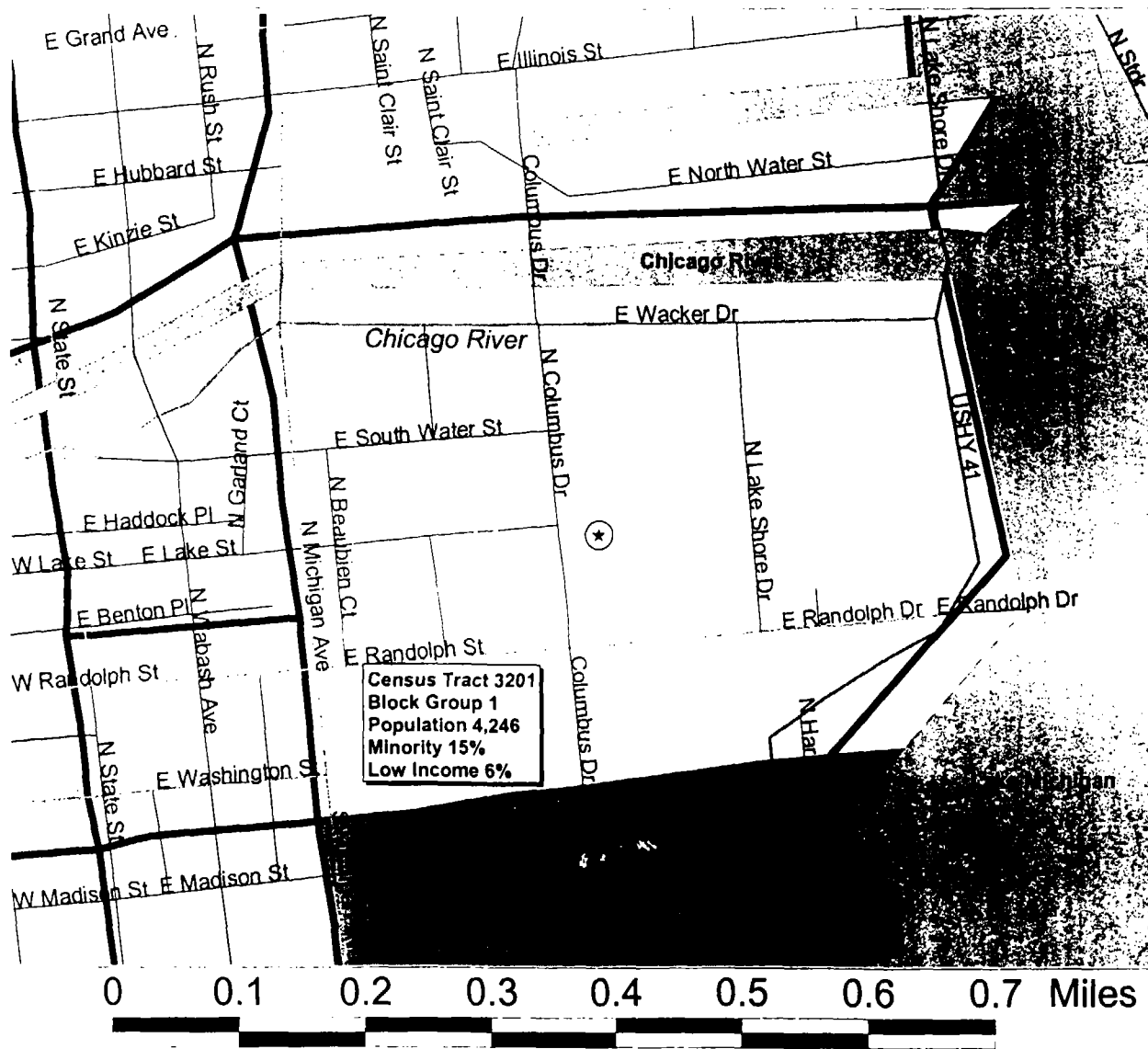


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26	01/17/02	Martino, F. Argonne National Laboratory	Jensen, J. U.S. EPA	Fax Transmission re: Soil Sample Results for the Family Golf Centers/ Lakeshore East Site	4
27	02/08/02	Jensen, L., U.S. EPA	Simon, V. & F. Micke; U.S. EPA	Memorandum re: Review of Family Golf Centers Data from Argonne National Laboratory and from RSSI	11
28	02/17/02	Chicago Tribune	Public	Newspaper Article: "Under Construction?"	4
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30	03/11/02	Micke, F., U.S. EPA	Port, E., RSSI & F. Martino, Argonne National Laboratory	Letter re: Review of Gamma Spectroscopy Data for the Family Golf Centers/Lakeshore East Site	4
31	03/14/02	STS Consultants, Ltd.	U.S. EPA	Final Report for the Lakeshore East Additional Radiation Survey Investi- gation w/ Cover Letter	299
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33	04/17/02	Berggreen, R., STS Consultants, Ltd.	Simon, V., U.S. EPA; et al.	FAX Transmission re: Corrected Pages from the February 8, 2002 Lake- shore East Additional Radiation Survey Investigation	7

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35	04/23/02	Micke, F., U.S. EPA	Port, E., RSSI	Letter re: Analysis of Samples Collected at the Family Golf Center	2
36	00/00/00	Simon, V. & F. Micke, U.S. EPA	Muno, W., U.S. EPA	Action Memorandum: Determination of Threat to Public Health or the Environment and Need for Time Critical Removal Action at the Family Golf Course/Lake Shore East Site (PENDING)	

# Region 5 Superfund EJ Analysis

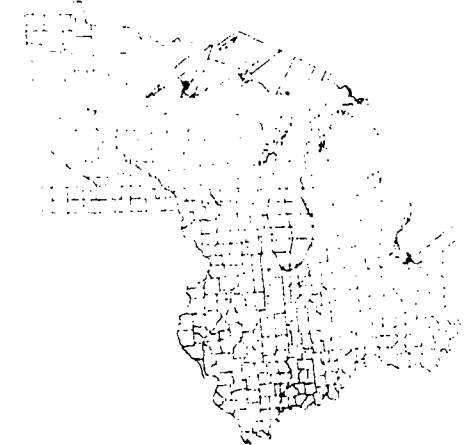
## Family Golf Center/Lake Shore East Chicago, IL



### EJ Identification

- Low Income and Minority Less than State Average
- Low Income or Minority at or Greater than State Average
- Low Income or Minority 2 Times or Greater than State Average  
[meets Region 5 EJ Case criteria]
- Site Location
- Block Group Boundary

**Region 5 EJ Case Criteria for Illinois**  
 Minority: 50% or greater  
 Low Income: 54% or greater



U.S. EPA Region 5  
 Superfund  
 Region 5

Date of Map 4/2/02

Source of Map 1990 Census Database